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LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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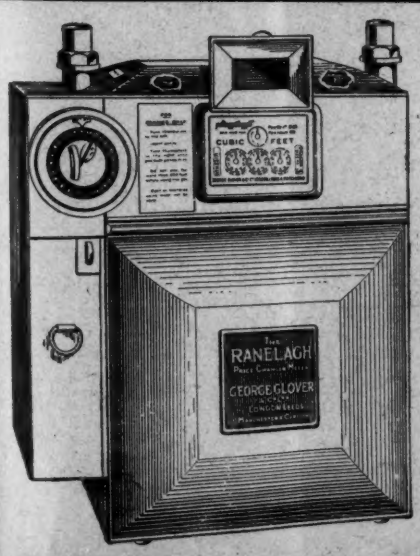

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VOL. CLXII., No. 3135.] WEDNESDAY, JUNE 13, 1923. [75TH YEAR.

EDITORIAL NOTES.

In Belfast—Years Gone By and Now.

A FORTNIGHT hence. the annual meeting of the Institution of Gas Engineers will be in full swing in the magnificent City Hall of Belfast. It was in the home of the civic authorities of the city that thirty years ago Mr. Denny Lane, M.A., of Cork, presided over the annual meeting of the Incorporated Gas Institute. There are still among us many who remember the strikingly picturesque figure of that scholar and gentleman, and earnest lover of his country and its natural charms. He was a speaker from whom flowed thought, and not platitudes; and he expressed his thoughts not only with eloquence, but with charming purity and rounded periods. And in it all was a keen insight into things as they were; and from what he saw, he constructed his anticipations of what they would be. Anyone who has a spare hour, and would like to devote it to being with Denny Lane once again, cannot do better than read the address which he delivered in Belfast to the Institute in 1893. There one will find, besides much else, the views of a great thinker on the then incipient competition with the gas industry from that (rightly used) great power electricity. Five years later—just a quarter of a century ago—the Institute was again meeting in Belfast. The scene of the meeting was then the Exhibition Hall in the Botanic Gardens; and that stalwart among his gas-engineering contemporaries—Mr. James Stelfox, then the Engineer of the Belfast Corporation Gas-Works—was in the Presidential Chair. He was an Engineer and a Manager who was always seeking to attain the most practical ends, and that progressively, as fresh knowledge and experience came to his aid. His name and the Belfast Gas-Works will always be associated with the working-scale research that was instituted into the Claus purification process. Denny Lane and James Stelfox have been gathered to their forefathers.

Now we have the worthy successor of the latter, Mr. J. D. Smith, M.Inst.C.E., in the Presidential Chair of the Institution; and the annual meeting is again about to be held in Belfast. The President can look back upon thirteen years' service with the Corporation as their Chief Gas Engineer and Manager; and he has carried on the technical work of the undertaking guided by that same engineering ability and instinct that so decisively placed his predecessor in the very front rank of his profession. Mr. Smith is not a man of many words, but he is as generous a worker as he is generous in nature. His plant and processes—manufacturing and distribution—are the proof; and to-day, too, they testify to his boldness in conception, design, and planning, and to confidence in selection, by the construction of a 7-million c.ft. spiral-guided holder. The city and the consumers generally have cause to be gratified that they have the right man not only as the Engineer of their gas-works, but as the technical adviser to the Gas Committee, and as General Manager of their gas affairs. We are sure there will be testimony to this from the Lord Mayor (Alderman W. G. Turner, J.P.) and the Chairman of the Gas Committee (Mr. Councillor F. Workman, D.L.) during the meeting. Those gas men and their ladies who will be fortunate enough then to be in Belfast will have, as the programme elsewhere indicates, good cause for self-congratulation. It shows a strong front in technical matters, constituted of the Presidential Address, reports of Committees, papers, and a lecture. Reference was made more specifically to these in the editorial on "The Belfast Arrangements" in our issue for April 18. There will also be a reception, luncheon, and visits—to the gas-works among other places. Those of the visitors who have not been to the Giant's Causeway will take the opportunity provided by the excursion on the Friday for going to that picturesque part; those who have been before will want to go again. Only fine weather will be required to make the visit of the members of the Institution to Belfast perfectly enjoyable and profitable. May it prevail!

Annual Report of the Institution Council.

THERE is nothing startling in the annual report of the Council of the Institution, which will be presented at the Belfast meeting. Yet the document is full of indication of the varied and important work for the industry which finds its starting-point, direction, and means of prosecution in the Institution. Everything technical pertaining to the gas industry comes within the province of the organization. It is a big field of operation; and every year sees the branches of the work shooting-out in fresh places—all with the view of enhancing our knowledge of the technical operations of the industry, or of finding solution to the fresh problems which invariably accompany expansion. Some men complain that while much work is done, determinate results still seem a long way off. This is frequently a complaint regarding research work. Research is always more or less uncertain until the end is reached. It is the object of research to ascertain what can be found by doing certain things in a certain manner. The ways of research sometimes lead to negative results; and then it is necessary to find some other direction or means for exploration. Part of the research the Institution has in hand is for the purpose of informing us why certain things happen or exist; part is for ascertaining and defining the ways and means for improving working or life efficiencies. Until the end is reached, results are always problematical; were they known, there would be no need for the research. And, moreover, results of research have sometimes to be put to the test of working experiment and experience—as in the case of refractory materials, the standard specification for certain of which has lately had to undergo revision. These remarks are made, because we have heard complaints as to voluminous reports, upon which unthinking and careless critics do not expend the time necessary for study to obtain a proper knowledge of their disclosures and findings.

However, running lightly over the report, it will be seen that several well-known names have during the year been removed from the roll of membership, through their call hence; but numerically the Institution, on balance, has been strengthened. Generally, the report is constituted of a statement as to the lines of the activities of the Council and the Committees. It and the accounts (particularly that of the Special Purposes Fund) show how manifold are those activities; and yet, from beginning to end, they all have some relationship, and everyone will, directly or indirectly, serve the other. We want the young professional gas man to be thoroughly educated and trained in the technique of his work. This is requisite to the putting into use of the lessons of research. We want the refractory materials incorporated in coal carbonizing and gasifying plants to have the greatest possible longevity, as this means reduced maintenance costs, which contribute, with the economies arising from higher gas-production efficiencies (to which direction

is likewise given by research), to the lowering of the costs of manufacture—so enabling the sale of gas to be at reduced prices per therm. The inter-relationship of all the work that is being carried on by the Institution can be traced by devoting to it a little thought. A great deal has been said lately about the adopted scheme for the better technical education of the men of the industry; and here we should like to emphasize the appeal which the Council make to every member of the Institution to do all in his power to encourage the juniors to prepare for the examinations. "The success of the scheme will depend on the hearty co-"operation of administrators and other well-wishers of the "industry." Those who are "well-wishers" of the industry can supply evidence of the fact by giving every practical support to the scheme. The industry must have in future the best possible men—men who are fully competent to meet all the varied obligations (which become greater, and not less) of every undertaking.

Reverting to research, we are glad to see that the British Refractories Research Association have now overcome the financial difficulties which were referred to by Mr. A. E. Broadberry at the last annual meeting of the Institution; and we re-echo the hope of the Council of the latter body that the progress of the work will now be accelerated. The far-reaching activities of the Gas Investigation Committee of the Institution and the Leeds University (which activities are so largely directed by Professor J. W. Cobb), are mentioned in the Council's report. Their extent is indicated by the fact that three reports have been prepared for presentation at the Belfast meeting. These will be the eighth, ninth, and tenth reports; and they will respectively treat of the "Fairweather" recording calorimeter, aëration in atmospheric burners, and the further examination of the blue and carburetted water-gas processes. Associated with these will be the report of the Institution Gas Fellowship on the gasification of coke with steam, with a special reference to nitrogen and sulphur. The Institution Research Fellow is Mr. Stuart Pexton, M.Sc.; and he and Prof. Cobb are the authors of this report. As to the Joint Committee on the Life of Gas-Meters, the Council state that this body have now practically concluded their labours, and that the report which will be presented at the meeting will be (so to speak) a summing-up or review of the work that has been done by them. It appears to be probable that the Committee will now end their functions; but they must not be allowed to dissolve without an acknowledgment of the valuable work they have accomplished, the enlightenment they have afforded, and the solid practical worth of their recommendations. In this connection, the members will be interested to learn more as to the operation of the chalk process for the removal from gas of that noxious compound, hydrocyanic acid.

There has been a good deal of co-operative work in technical matters between the Institution and the Society of British Gas Industries. The Council's report shows this. It is right and proper. The producers of gas plant and appliances are as intimately concerned in research into, and the improvement of, structural elements and working efficiencies as are the suppliers of gas. Representatives of the Society were on the Life of Gas-Meters Joint Committee; and the Society are also represented on the Refractories Materials Committee. There has been conference during the year on the subject of Standard Gas-Valve Flanges. A new set of standards has been approved; and it has been submitted to the British Engineering Standards Association for adoption. The Council have also been discussing with the Society the standard conditions of contract; and it has been agreed to revert to the original payment terms that were in force before the war. The value of co-operation between the Society and the Institution needs no further attestation. Matters are ever rising to the surface over which consultation and decision as between the two bodies are necessary. We are glad to see that the Council of the Institution have taken up the question of the testing of gas-ovens. This is a difficult problem. The efficiencies of gas-ovens have been hitherto tested in manners that differ largely in their results; and the methods have been crude and unreliable. So much so has this been the case that between one test and another there was no relation in result or meaning. We hope that something will be achieved which will give us a reliable test for gas-ovens; and if a method is discoverable, Mr. Arthur Forshaw, M.Sc., who has been appointed Chemist for this work, will not fail to unearth it. Certain it is he will have every encouragement from the Chairman (Mr. A. E. Broadberry) and the other members of the Committee.

The report treats of several other matters. The Institution were concerned in the various Departmental Committee inquiries that have been held into questions affecting the interests of the industry; they have, through the Council, given support to the provision of a Gas Section at the British Empire Exhibition in 1924, and, nearer in point of time, to the National Gas Exhibition to be held in Birmingham from Sept. 17 to Oct. 3 next. Among other matters, information is given as to the work of the National Illumination Committee, upon which the Institution has representation, and to the Corbet Woodall Scholarship. Mention is made, too, of the fact that the new experimental gas plant for the Leeds University, which has been erected to the memory of Sir Corbet, is now approaching completion.

From this brief review, it will be seen how varied and how far-reaching are the questions with which the Council of the Institution have to deal. There is one aspect of the organization of the industry that is advantageous. Each body is, so to speak, a specialist for one definite section of work; and yet, when necessary, they can co-operate. The report before us distinctly points to this, with the technical work of the industry as the illustration.

Low-Temperature Carbonization by the Medium of Water Gas.

A cogent article, with the above title, appears in our columns this week. It is from the pen of Mr. F. D. Marshall, whose explorations in the realm of gas manufacture—both high and low temperature—are well known. He has long been of opinion that our methods of making gas are wrong, and that the results in gas and B.Th.U. are not commensurate with the fuel and labour expended in obtaining them. The process as at present practised is, according to our contributor, most illogical, because not only do we excessively expend heat in the making of the gas, but the method of doing it is such that the high calorific value methane, ethane, and propane are degraded, in favour of an increased quantity of hydrogen; and then—the paradox of it all—we import into the gas more hydrogen in the form of water gas enriched by oil brought from abroad. We cannot gainsay this, nor can we deny that only about 21 to 22 p.ct. of the heat of the fuel used for carbonizing the coal is actually so applied; the whole of the balance passing away in various directions—escaping up the chimney as waste products, lost by radiation, lost in the ash and clinker, or carried off in the hot gas and incandescent coke. There are many workers trying to alter these conditions; and the coming of the therm system has energized their investigations to this end. But Mr. Marshall holds that everything points to methods which will enable the consumer to receive as many therms as possible in the least practicable quantity of gas to carry them. We agree, providing the word "practicable" embraces these important factors in the problem—the lowest possible selling price per therm, and the most eligible gas for realizing complete combustion in the appliances of the consumer. Instead of degrading the methane, ethane, propane, and their homologues, he would preserve them by using low temperature for carbonization, and carry them and increase the quantity of the gas by the use of blue water gas. Such a gas would be practically free of the harassing naphthalene, would be low in sulphur compounds, and the inerts would probably not exceed 8 p.ct. Mr. Marshall always has a fascinating way with him; and in this article the personal trait is quite pronounced. At the beginning one's interest is arrested, and it is maintained to the end of the argument—both the critical part of it as to defects in existing practices, and the constructive part as to how he proposes to avoid them. The principles upon which this is to be done are embodied in the Marshall-Easton process. All idea of the low-temperature process standing alone on a commercial basis has been abandoned by Mr. Marshall; as the fundamental part of a combined process, it is altogether another matter.

Before introducing us to the Marshall-Easton process, in which the operations of carbonization and water-gas making are carried out independently, our contributor points to the defects, as he sees them, of the single complete gasification process, in which a retort is superimposed on a water-gas generator; but as in the latter, so in the new system—the hot water gas passes up through the coal charge in the

retort, while the blow gases are ignited in the chequerwork surrounding the retort. Our contributor makes it perfectly clear that he is claiming no originality in respect of the fundamental idea of using the potential and sensible heat of the blow gas, together with the sensible heat of the water gas evolved by the gasification of fuel during the operations of water-gas making. What he does is to show how, in his opinion, these heats may be most economically and commercially employed to produce successful results. Apart from the structural features of the Marshall-Easton twin-propeller retort, this is one of the interesting features of the article. It is clear that Mr. Marshall is fully conversant with the history of this subject. He quotes the investigations of that eminent scientist Dr. Strache, of Vienna, with a retort superimposed on a water-gas generator, and refers to the apparatus later devised, on the lines of Strache, by Mr. Herbert E. Smith, Engineer to Messrs. Kramer and Aarts, who submitted his designs to our contributor in 1911. Between the Continental and British designs there is a remarkable family likeness; and they all operate in much the same manner. Both Strache's and Smith's designs are based on using the heats developed during water-gas making to accomplish the preliminary carbonization of the coal before the resultant coke enters the water-gas generator, and, by the carbonization of the coal, to reinforce the potential heat value of the comparatively poor water gas by producing in one operation a mixed water and coal gas. Also both Strache and Smith proposed that the retort superimposed on the water-gas generator should be of fireclay; and they both used the heat of combustion of the blow gas to heat the retort. No doubt there are many others who have been at work in the same direction; but we refer to Strache's and Smith's proposals as illustrations of a growing family, varying but little in their features.

The considerations that have led Mr. Marshall to the conclusion that the most scientific, economical, and efficient plan is separate coal carbonization and separate water-gas production appear to be these: In the first place, although Strache and Smith had at their service the very considerable potential heat of the combustion of the carbon monoxide in the blow gas, this heat could only be used intermittently, and its storage in the chequerwork surrounding the retort was a source of great heat loss owing to radiation, &c. In the second place, this large loss was aggravated by the fact that they were trying to conduct the heat through the resistance of a 3-in. thick fireclay retort of some 2 to 3 ft. internal diameter filled with a solid mass of coal. Neither Strache nor Smith seems to have mastered the question of the maximum thickness of coal a given heat could penetrate in a given time to reach the core, and so effect complete carbonization. Even assuming that they had at their disposal a constant temperature on the outside of the retort of (say) 2500° Fahr., after deducting heat losses, gas-works experience would have pointed out that for this heat to penetrate evenly a column of coal from 2 ft. in thickness and over was an impossibility during the time that their source of heat lasted—that is to say, during the period of the gasification of a full charge of fuel in the water-gas generator. Assuming, further, that the column of superimposed coal could be thoroughly carbonized to coke to feed the generator, and so provide sufficient heat, and that the carbonization above and the gasification below synchronized, the result would be that the whole of the coke producible from the coal would be gasified to water gas, which would be in such quantity in ratio to the coal gas evolved from the retort as completely to swamp the coal gas, and so render re-enforcement illusory. Moreover, the complete gasification of all the coke would leave nothing over for fuel to provide the necessary steam for the generator blow and for the driving of the turbine blower and accessories, which amounts to nearly 18 p.ct. of the coke produced.

We see from these considerations that Mr. Marshall is entirely opposed to a single apparatus comprising a retort and water-gas generator combined. He therefore proposes a dual design, by which means the supply of coke to the generator is capable of adjustment to the quality of the gas required; and in this way the rich low-temperature gas from the retort is mixed with the water-gas in just the proportion to give a far higher quality of gas than is possible with the single-type design. From a long experience he holds that, with the use of silicon cast-iron retorts and a layer of coal some $4\frac{1}{2}$ in. thick, carbonization can be quickly effected, and the coke can be produced as rapidly as the demand is made for it by the water-gas generator. He is also convinced from the same experience that to make a low-temperature retort commercially successful, it must be continuous in action, and automatically fed and discharged. Therefore in the Marshall-Easton twin propeller retort, two uniquely constructed screws or propellers are employed (a single screw or helix is useless for the purpose), travelling in the same rotary direction, but arranged so that the blades of one helix or screw scrapes the other. By this means no coal, however sticky, can hang up in the retort; and the material is not churned round the helices, but just propelled downwards in a quiescent state. The coal disposes itself automatically in the spaces between the helices in two segmental rings, 6 in. or so high and $4\frac{1}{2}$ in. thick in the form of an hour-glass; the circumference of the two rings together being $7\frac{1}{2}$ ft. in a small retort having a 10-ton per diem throughput. There are from twenty to forty helices of 18 in. to 24 in. diameter, according to the throughput of the retort; and as the smallest ring is 7 ft. 6 in. by 6 in. by $4\frac{1}{2}$ in., it is clear there is a considerable surface of coal of inconsiderable thickness presented to the heat, and there is nothing to impede the heat beyond the $1\frac{1}{4}$-in. silicon cast-iron wall of the retort. The heating of the retort, as previously mentioned, is by means of the blow gas from a twin water-gas generator, with the sensible heat of the water-gas passing upwards through the interior of the retort. The retorts can be made with a throughput of 8 to 20 tons per diem. Mr. Marshall's article enters into the details of the system more extensively; and many data are given as to low-temperature carbonization by recoverable heat during the process of water-gas production, also regarding the heat available from water-gas manufacture, the production of mixed gas, the bye-products, cost of operation, &c. These must stand for investigation by our readers; but if anyone has aught to say against the figures, our pages are open for the purpose.

Reading the article reminds us that on the occasion that Mr. Marshall delivered a lecture on "Low-Temperature Carbonization" to the Manchester District Junior Gas Association in 1913, at the Manchester University, he made use of the expression: "For the present I see through a glass darkly as to how far a low-temperature process will be of any assistance to our profession." We believe that up to the advent of the therm period, Mr. Marshall was of the same mind. Of our own knowledge we can testify to the tenacity and patience our friend has shown in investigating, on a practical scale, the problems associated with low-temperature carbonization, and of his exceptional experience in a direction far removed from the orthodox high-temperature methods. In the article in later columns, he has sought to prove how low-temperature carbonization will really come to the forefront as an auxiliary to modern gas-works practice. He is confident; but the verdict must be left to time and working experience. His article is clear and well-reasoned; and, even if our readers do not agree with the author, they will, we are sure, be greatly interested in the case he presents for the process which he introduces to-day to the gas profession.

To Record Appreciation of the Services of Prof. Smithells.

ANNOUNCEMENT has been made in the "JOURNAL" that Prof. Arthur Smithells, F.R.S., is resigning the Chair of Chemistry at the Leeds University, which (including the final years of the Yorkshire College) he has held since 1885. Our friend's association with the gas industry—first, through his chemical and physical work (notably in connection with investigations into the combustion of gases and the structure of flame), and subsequently through the Department of Coal Gas and Fuel Industries at the University—and the place that he has established for himself not only in connection with the greater application of science to our technical operations, but in the affections of the professional men of the industry, of whom some of the younger ones have been in intimate touch with him through his academic duties, will together ensure the liveliest interest in, and material assistance to, a movement which has lately been inaugurated. It is felt by the friends of Prof. Smithells at the Leeds University and elsewhere that it is desirable to place on record in some appropriate way an appreciation of his distinguished services; and therefore it has been decided to raise a fund for the dual purpose of: (1) Commissioning an artist to paint a portrait of Prof. Smithells for presentation to the University; and (2) establishing in his name and

on his advice a Fellowship or Scholarship within the University. It is seen from this that nothing in the nature of a personal gift is contemplated—the scheme is first purely appreciative, and secondly commemorative. No definite invitation has yet been made to the gas industry to assist in providing the necessary funds; but we have great confidence that the industry will desire to participate, for Prof. Smithells has been a spring of influence, scientifically and practically, in our midst, and in ways which only those behind the scenes can fully realize. Probably the industry may wish to make its appeal for subscriptions in its own way, and to raise its own portion of the "Smithells Fund," and then transfer the money so raised in one sum into it. Whatever course is adopted, we are sure there will be a good response. Interest has already been aroused in the industry by the issue of information to personal friends and old pupils (past and present); and we feel that this interest will rapidly become widespread through this little preliminary reference to the movement.

Policy in Small Undertakings—Are Objections to the Therm System Valid?

It is refreshing to have from the manager of a small works an account of his experiences. They are not those of the managers of larger works, in which there is a devolution of duties to other officials, though the responsibility of the whole of the functions is upon the chief. The manager of the small works has to attend to the manufacturing operations, look after consumers' complaints, adjust their appliances, make meter surveys, and collect the rental. Those are the varied duties and occupations of Mr. F. Welsh, of Duns; and he makes a little over 10 million c.ft. of gas per annum. He presided at the meeting of the Waverley Association of Gas Managers last Thursday. We are glad to see that the Association provided the best opportunity they could for a manager engaged in a sphere small in its way, but varied in its demands upon him—and these not devoid of trials and tribulations of an intensity equal to those that fall upon the executive chief of a larger works. Knowledge of the experiences of colleagues carrying on their duties in such circumstances helps to spread throughout the profession that sympathy and interest which is so helpful. Mr. Welsh's address is a contribution to the written history of affairs in the part of the industry where there is a concentration upon one man of full responsibility and of the discharge of duties.

In his opening remarks, the President had some observations to make upon general matters. He mentioned the Ruhr occupation, and the resulting enlarged coal export business there has been from England and Scotland, and which had the effect of raising the price of coal to home consumers. But a change has set in; whether it will continue is not at all a certainty. It may for the time being, while domestic requirements are at a low ebb, as they are likely to be in this country for a period, despite the few shillings reduction per ton that has been made by the coal retailers to tempt householders to fill their cellars during the summer months. Still, there is a change in the demand from abroad; and those collieries and dealers in the North of England with stocks which they have been preserving in the hope of securing still better prices, have had to find relief by letting them go at somewhat lower rates. In other coal districts not favoured with such a large export business, there is a tendency to cling to the higher prices. But even in those areas, there are marked differences in quotations; and it is known that selling has been going on not merely at the customary few pence differences, but at differences amounting to as much as 1s. 6d. to 2s. per ton. Naturally the collieries, with contracts now in the making, are anxious to keep quotations at the level to which they ascended. But it is well to note the tendency of the present time—whether the manager be in charge of a large or a small works. The prices for coke, too, are hardly likely to be maintained at the figures that have been obtained, with prices of coal—both pithead and retail—showing a downward movement, and this in summer, when the demand for coke declines. Therefore the better prices for the chief bye-product, which have been ruling for some months, and over which Mr. Welsh finds gratification, are not likely to continue unaffected.

It is in this direction, combined with the smaller quantity of coal that he has now to purchase, that the President will, in his circumstances, find an advantage in the Tully plant (of 50,000 c.ft. per day capacity) which he brought into operation in 1921. In this plant there was material advantage during the memorable coal strike, when, by the way, it is interesting to observe, it was found that it would accommodate itself to the gasification not only of coal and coke, but wood and peat. In fact, the plant was invaluable in those stressful days, and especially as the President, during his nine years' tenure of the office of Manager of the undertaking, had increased the output of gas by 80 p.ct.—principally for heating and cooking; Duns possessing little in the way of an industrial field for gas. Therefore, the domestic consumers naturally looked to the gas-works for the wherewithal to cook and to perform their other heating operations when coal was scarce throughout the country; and they were not disappointed. However, that was an abnormal experience in demand and supply. Now Mr. Welsh is getting regularly about 13,000 c.ft. of gas per ton of coal handled, calculating on the combined use of a bed of horizontal retorts and the Tully plant, and diluting the production of the former by from 30 to 35 p.ct. of that of the latter. The calorific value is not stated, as apparently jet photometers are still used as the index to quality. However, although the quality of the gas was only gradually reduced, there were complaints; but it seems to us perfectly clear that these ought not to be charged to the gas, inasmuch as the President himself says that some were due to faulty services, others to unsuitable and dirty burners, and others again to indifferent regulation. Tabulating the complaints, he found that three-fourths were due to defective lighting. This is all interesting, because it points distinctly to the line of action a small undertaking should take. A gas undertaking so situated has not the strength of a larger one; and therefore, if anything, the greater the necessity for self-protection, if the economies of modern invention and research in manufacture and utilization are to be brought to bear. Self-protection is to be gained by the administrators of such undertakings doing what is necessary in the way of maintaining efficiency at the point of use. Mr. Welsh is clearly of this opinion; for he tells us that he is afraid the lighting branch of the business has not been getting the attention it deserved, and that he is convinced a small charge included in the price per 1000 c.ft. to cover the free maintenance of fittings is a proper thing. Of course, it cannot be expected that maintenance work can be carried out personally by a manager with such manifold duties as those upon which Mr. Welsh is engaged; and there is no question that the small additional charge per 1000 c.ft., which would be involved by a competent fitter giving part of his time to this work in a district such as Duns, would be very profitable in satisfaction to the consumers through the efficiency of their appliances, and in protection of the interests of the gas suppliers through the same cause. One can be "penny wise, but pound foolish." Now Mr. Welsh finds he has no difficulty in obtaining a regular quality with his mixed gas; and he is finding the Tully plant a good auxiliary to the ordinary gas production. With the two plants, he can work just as circumstances dictate. But it is excellent policy to pay as close attention to the consumers' end as to the gas-making end—neither should be the subject of neglect.

There is one other point in the address which is of current interest. It is the view of the Manager of a small works as to the adoption of the therm system. There are four objections raised to it by Mr. Welsh; and, with all deference, we submit that they are not of a substantial nature. First, he is of opinion that the change from the volumetric to the heat basis of charge would mean a considerable increase of work on the part of the manager. We do not think so. Admittedly, there would be an increase at the advent. But an intelligent manager would quickly become accustomed to the conversions and calculations; and thus the work would gradually lighten. Moreover, the commercial advantages of the therm system in these days when heating plays such an important part in the development of the gas business cannot be over-estimated. In the second place, the President is afraid it will take a long time before the consumers become reconciled to the therm. In Duns, something like 10 million c.ft. of gas are sold per annum; in the areas of the three London Gas Companies, 256,116,463 therms were sold last year. Of the 1,406,732 consumers in the areas of these three Companies, no less than 916,161 are on the prepayment meter system. They have become "reconciled" to the change; and we guarantee that Duns gas consumers are not endowed with less mental perception than the mass of London consumers. Then Mr. Welsh

says there is also considerable expense to be met in the installation of a calorimeter; we presume he means a recording calorimeter. The Gas Regulation Act says: "The "prescribed apparatus shall, in the case of any undertakers "who have sold in the preceding year more than 100 million c.ft. of gas, and in any other case in which it appears "necessary to the Gas Referees, include a calorimeter for "the production of a continuous record of the calorific value "of the gas which is being supplied." Now Duns only supplies about one-tenth of 100 million c.ft. per annum, so that it will be a very long time before it is likely that the installation of a continuous calorimeter would be required there. The fourth objection is that the local authority would also have to appoint a suitable person to test the gas periodically. The Gas Regulation Act says: "A gas "examiner may be appointed to act on behalf of any number "of local authorities; and the local authorities may enter "into such arrangements as they think fit in regard to the "joint appointment and employment of such gas examiner." Thus a number of local authorities can appoint one examiner. It will be seen from this that the Act has been framed so as not to exclude small undertakings from its advantages, and even non-statutory ones can come under its provisions through a Special Order under section 10.

The CO Reduction Process.

Our postal deliveries, chats with gas engineers, and references at meetings all disclose the fact that a great many professional men in the industry are regarding with undisguised dissatisfaction the booming that the suggested carbon monoxide reduction process has had in the public Press. This feeling expressed is not surprising. What most gas engineers are thinking was well expressed by Mr. Percy S. Hoyte, on the occasion of the visit of the members of the Southern Association of Gas Engineers and Managers to Plymouth last Friday, as reported in this issue. A letter also appears in our "Correspondence" columns this week, which puts a few very direct questions on the subject. This is a sample of certain other letters, which, however, are not for publication. The contributed article by "H" on p. 591 of last week's issue has also been the subject of comment among engineers, who have been wondering whether a reply is going to be made to it.

Benzole and Taxation.

If the Government want to see a growth of the home production of motor fuel, they must encourage it, and not do those things that are repressive. Probably the members of the Departmental Committee of the Ministry of Transport will fully appreciate this now that they have heard the forcible evidence submitted to them by Mr. W. G. Adam, Superintendent of the Tar and Ammonia Works of the Gas Light and Coke Company, and Technical Member of the Council of the National Benzole Association. It was on behalf of the latter body that he appeared before the Committee. The evidence is reported in our "Miscellaneous News" columns to-day; and it is very enlightening as to the position of benzole in this country. We suggest that the Committee should give serious consideration to the statistics that were presented by Mr. Adam, and ask themselves why it is that, with a potential home production of benzole amounting to about 46,200,000 gallons (17,000,000 gallons by gas-works, and 29,200,000 gallons by coke-oven plants), last year only 11,155,756 gallons were produced in this country, and this year it is estimated that the output will be 17,500,000 gallons. This last figure is only 37·8 p.ct. of the potential. They will find two main reasons for the great disparity between potentiality and actuality. One is the fact that the working of the coke-ovens depends so largely upon the state of trade in the iron and steel industries; and the other is that, while in the case of gas-works there is no great fluctuation in the demand for gas, the present margin between the value of benzole as a constituent of town gas and its value as a refined motor benzole, after deducting working costs, is so small as to be negligible. It is for this reason that several gas-washing plants have been closed down by gas undertakings—the Gas Light and Coke Company among them. Therefore, instead of taxing home-produced benzole, it is obvious that the best encouragement that can be given to the producers would be to allow them the improved position that exemption from a tax would give in relation to taxed imported petrol. Ample reason was given by Mr. Adam for doing all possible to promote the output of benzole at home; at any rate, for not taking any step that would reduce the effective capacity of existing plant. The lessons of the war should alone convince the Government as to the need for stimulating, and not repressing, the home production of benzole for essential transport and for explosives purposes. Where should we be in time of war if there was not a sufficient supply of benzole, toluole, and xylene for the manufacture of explosives and gases? Another important point in the evidence of Mr. Adam is the difficulty which he foresees in collecting a tax on benzole. The reasons which he advanced for this difficulty will be found in our report. The Committee cannot possibly avoid giving due consideration—and we hope favourable consideration—to a case presented with so much lucidity, care, and weight.

Dissolution of the "N.A.T.G.O."

In our "Correspondence" columns, a letter appears, signed by Mr. R. G. Shadbolt and Mr. F. C. Briggs, on behalf of the National Association of Technical Gas Officials, in which they announce that the organization is again solvent, but that, owing to the fact that it cannot effectively operate alone, and the Institution of Gas Engineers do not consider the time opportune for revising their constitution, it has been decided to dissolve the Association. The letters that have passed between the Association and the Institution are appended to that of our correspondents. So a well-meant effort, through insufficient support, comes to an end.

Suicides by Gas

It cannot be denied that the number of suicides by coal gas has increased the last few years; and the probability is that the number of people who have sacrificed their lives by other means has, in consequence, been on the decline. People who wish to end their lives will do so in one way or another. There is no question that the growth of the recourse to gas for this deplorable purpose has been due to the publicity given to it in the section of the Press that thrives on sensation mongers. The other night in the House of Commons, Sir F. Hall inquired as to the number of persons in Great Britain who committed suicide by gas in 1920, 1921, and 1922. The Minister of Health (Mr. Neville Chamberlain) replied that he would give the figures for England and Wales (excluding Scotland) in the Official Report. This he has done. It is seen that in 1920, 160 males and 110 females ended their lives by "coal gas;" in 1921, 231 males and 130 females; and in 1922, 323 males and 173 females. In 1921, one case is attributed to carbon monoxide; and in 1922, four cases—these in addition to the "coal gas" figures. The increase during the period of pronounced newspaper publicity is seen. Even so, the figures only average out to little more than ten per million of the population.

Combined Gas and Electricity Undertakings.

When a gas undertaking combines with its business an electricity plant for public supply purposes, the local authority have the right, under the General Acts, to purchase the electricity concern at the end of 42 years, or at subsequent periods of ten years. But the same power does not apply to the gas-works. In view of the fact that electricity is an extension of the business of the gas undertaking, and that the *raison d'être* for the combination is that the two businesses can in a restricted district be developed together more economically and profitably than separately, and thus render better and cheaper service to the community, it would not be right that the local authority should have power to purchase at the end of a given period the one concern without the other. The two businesses would by the end of the period have become so entwined that they could not well be separated without doing damage to both. Moreover, the administrators of the two concerns would naturally see to it that the strength of the gas undertaking was not impaired if there was any probability of the electricity part being cut away at the end of 42 years. The point was raised, before the Unopposed Bills Committee of the House of Commons, when the Oakham Gas and Electricity Bill was before them last week. Mr. A. H. Seabrook, who has advised the Company in this matter, supplied sufficient reasons as to why the permissive purchase powers should apply to both undertakings, and not to the electrical one alone. In the end, the Committee agreed with this, on the ground that Oakham was a small

place, and could not carry two competing undertakings of the kind. This, however, is not to be taken as a precedent where the circumstances are different. But it is an important precedent for small districts requiring the two services. By the way, the Swanage Gas and Electricity Bill has passed the Unopposed Bills Committee of the House of Lords. It provides for the transfer of the undertaking of the Swanage Electricity Company to the Gas Company.

Mond Gas and Domestic Supply.

In the Bill which the South Staffordshire Mond Gas Company have now before Parliament, they originally sought powers which would have removed certain restrictions in their previous Acts, and would have enabled them to supply gas to customers for illuminating purposes. The Gas Committee of the Birmingham Corporation, in their annual report, state that the Company have now agreed not to ask for the repeal of the restrictions prohibiting the supply of Mond gas for purposes of illumination or for use in private dwellings, except by way of supply in bulk.

Subsidences through Mine Workings.

The Secretary of Mines recently announced that a Royal Commission was to be appointed to consider the above subject. The selection of a Committee has now been completed; and the Chairman will be the Right Hon. the Viscount Chelmsford. It is a strong Committee. The reference to them is to consider the operation of the law relating to the support of the surface of the land and of buildings or works on or under the surface by underlying or adjacent minerals; to inquire into the extent and gravity of the damage caused by subsidence owing to the extraction of minerals and the incidence of the resulting liability; and to report what steps should be taken, by legislation or otherwise, to remedy, equitably to all persons concerned, any defects or hardships that may be found to arise in existing conditions. The Secretary to the Commission will be Mr. W. G. Nott-Bower, of the Mines Department, and the Assistant Secretary, Mr. G. C. North, of the Ministry of Health. Many gas undertakings in mining areas will be able to advance evidence as to the damage to, and the insecurity of, their property, and the danger of the resulting escape of gas through subsidences. The loss of gas, and the cost of restoring ruptures of the distribution system and making good the subsidence of the plant generally, aggregate to a substantial sum annually. Perhaps some of these gas undertakings will be getting into communication with the Secretary to the Commission. He will be found at 5, Old Palace Yard, Westminster, S.W. 1. Perhaps, however, it will be well first to ascertain whether the National Gas Council intend to organize evidence on behalf of the industry.

A Nitrate Agreement.

The announcement is made that the Association of Chilian Nitrate Producers have decided to continue in existence until June, 1924. This is regarded as a further guarantee of stable conditions in the industry; and it is believed that the control thus obtained should make it possible for the regulation of supply in accordance with the demand. It is also stated that negotiations for a further extension of the life of the Association will now be actively taken in hand; and should this movement be successful, the nightmare of over-production which worries producing companies will be removed for a long time.

America's Increasing Coal Output.

The miners in this country, who, in defence of the seven-hour day, prefer to see coal production per man reduced and costs per ton increased, should note that in America the output of coal has been increasing the last twenty years at the rate of 18 million tons per annum, and is now upwards of 600 million tons a year. Mr. G. S. Rice, of the United States Bureau of Mines, is the authority for this statement.

Institution of Civil Engineers.—The annual conversazione of the Institution of Civil Engineers has been fixed to take place on Thursday, July 12, at the Institution, at 8 p.m.

Institution of Heating and Ventilating Engineers.—The summer meeting of the Institution will be held in the Grand Hotel, Folkestone, on Tuesday, June 19. One of the matters to be considered is a report on research work at University College.

PERSONAL.

Interesting presentations were made to the two veterans of the Derby Gas Light and Coke Company, at a meeting of the Directors last Wednesday, when the Chairman (Mr. William Woolley) handed both to Mr. H. BULLIVANT (the Secretary) and to Mr. S. WEBSTER (the Chief Clerk) a handsome Crown Derby china tea service, as an appreciation from the Directors of the completion of half-a-century in their service. He spoke in terms of high praise of the valuable services rendered to the Company by these gentlemen, and wished them many more years of good and useful service. Thanks were returned by Mr. Bullivant and Mr. Webster, who assured the Directors that the presents would be among their most prized possessions.

OBITUARY.

In our notice last week of the death of Mr. WILLIAM GARLICK, it was stated that he retired in April. This is not the case. He worked up to the last moment; a growth on the liver compelling him to take to his bed, which he never left until death.

LONDON DISTRICT EXECUTIVE BOARD OF THE NATIONAL GAS COUNCIL.

Annual Meeting.

The Annual Meeting of the District Executive Board of the National Gas Council for the London District was held at No. 30, Grosvenor Gardens, London, S.W., on May 24—Mr. Stanley H. Jones in the chair.

The annual report was submitted, and the following elections to office were made.

Chairman.—Mr. S. H. Jones.
Vice-Chairman.—Mr. D. Milne Watson.
Secretary.—Mr. C. M. Plowman.
Management Committee.—Messrs. W. Graham Bradshaw, A. E. Broadberry, A. Caddick, T. Hardie, F. H. Jones, S. H. Jones, A. A. Johnston, R. J. Neville Neville, and D. Milne Watson.

Mr. F. H. Jones was re-elected a member of the Central Executive Board.

ANNUAL TABLES OF ELECTRICITY UNDERTAKINGS.*

REGARDING the thirty-sixth edition of these useful tables, we always consider the information in the volume as being highly valuable for reference, in view of the fact that it is quite up-to-date. Although the sales and financial results of the undertakings are not given, the particulars cover quite a good area of ground regarding management, generating, converting, and distributing systems, charges, and so forth. Included in the present edition, too, are data as to motor-hiring schemes, oil fuel, showrooms, &c., of the various undertakings. Not only are British electricity supply undertakings and electric power companies dealt with, but statistics have been brought together regarding Colonial and foreign concerns; and this will increase the usefulness of the volume to manufacturers and others doing business abroad. Prices per unit will be found highly interesting. Looking at these prices, 8d., 9d., and 10d. appear to be very popular for lighting, except in areas particularly favoured by the demand for current for this purpose. Power prices we see range from anything between (say) 1d. and 4d. per unit, and one case we noticed in glancing through the volume was at 7d. Heating and cooking charges, or the offers of charges, have also considerable variation. They, too, may range between 1d. and 5d. per unit. We will not comment on the figures. Their appearance in the volume shows that the editor has aimed at accuracy, and has not attempted to conceal the truth that high charges still continue in the electricity industry as in places in that of gas supply. So far as the data extend, we can, with a fair amount of confidence, recommend the volume on the score of reliability.

* "The 'Electrician' Annual Tables of Electricity Undertakings." London: Benn Bros., Ltd. Price 10s. net; postage 9d. extra.

A Biography of Colloid Chemistry.—The National Research Council, of No. 1701, Massachusetts Avenue, Washington (D.C.), have recently issued a Colloid Biography, in mimeographed form. The author—Dr. Harry N. Holmes, of Oberlin College, Chairman of the National Research Council Committee on the Chemistry of Colloids—intends this edition to be preliminary to a more comprehensive one. Yet it is a book of 135 pages, containing 1800 references on 106 topics. All the references are classified, and many are accompanied by brief comment as an aid in deciding on their relative importance. The book may be purchased from the Washington office at $1.

ELECTRICITY SUPPLY MEMORANDA.

THE members of the electricity industry are always on the alert for people who they think will be generous enough to help them to advance the interests of electricity. It is quite a good desire; but people who are willing to adopt a philanthropic rôle towards a public utility concern are few and far between. At any rate, we have not met with many of them. The attitude of landlords (who in these times think themselves hard done by) and their tenants towards supplies of commodities such as gas and electricity is that as much as possible should be squeezed out of them, and as little as possible rendered to them in return. Most people seem to consider that the railway companies should do more for them, and at a cheaper rate. We know, too, that the public want gas, but they desire all the provision that has to be made to be on the lowest terms possible. They themselves are not willing to assist gas undertakings more than they are compelled to do; they think gas undertakings and railway companies quite capable of helping themselves. Therefore they are not particularly desirous of doing things to aid in the cultivation of a more lucrative business. If they are disposed to help electricity concerns, then these are in an enviable and an unusual position. We have not the slightest doubt that the public are totally unprepared to dip their hands deeply into their own pockets to help electricity supply, though we frequently see electrical men counselling them how they could do this.

Are Tenants and Landlords Philanthropic?

These considerations are revived by an article published in the "Electrical Review." It is headed "Difficulties experienced in the Wiring of Houses;" and the author is Mr. R. E. Gamlen. The ownership of houses is the root difficulty, seeing that tenants do not care about going to the expense of wiring houses of which they are not the owners. The writer opines that those who have leased their houses for a good number of years are an easy conquest, if it be pointed out to them that the resulting "economies," absence of dirt, and the abolition of the need to redecorate so often will quickly off-set the money expended on wiring. The writer is optimistic. According to him, electrical wiring ought to be a good business to-day (instead of being so slack as it is), in view of the number of people who have just lately acquired the houses in which they reside. But those in respect of whom there is most difficulty are the tenants who have leased their houses for only two or three years; and in this class there is, it is thought, a clear case for some arrangement between landlord and tenant. It is, he says, obvious that, if an occupier leaves his house within (say) two years of wiring it, the incoming tenant will not agree to pay for the installation—the argument usually put forward being that, as the wiring was done by the previous tenant, he is at liberty to remove it. But it is pointed out that it is obvious the cost of removal would be more than the scrap would fetch; and, of course, there is the other point that anything fastened to the walls by the tenant becomes the property of the landlord when the tenant vacates the premises. But here is the writer's main point:

Wiring Difficulties, and How to Overcome Them.

> The landlord, owing to the increased value of his property, and the possibility of increased rent, should be willing, in the event of his tenant leaving within the period of five years, to allow a sum of money for the installation, less an allowance for depreciation. The percentage of depreciation only remains to be fixed. As five years has been taken as the benefit period, depreciation should be fixed at a rate of 20 p.ct. per annum. If the house were vacated in three years, and the tenant paid £50 for his wiring, the amount he would receive would be £20 from the landlord.

In these days landlords are crying out against the oppression of their conditions; and we cannot see them or their tenants (who have their grievances) taking a philanthropic view regarding the wiring of houses in the interests of the suppliers of electricity. Landlords did not take that interest in other days when things were much easier; and they are not likely to do so now. But Mr. Gamlen thinks otherwise. He believes that, if a scheme were prepared on the lines he indicates, and both landlords and tenants were circularized, an appreciable number of new consumers should be obtained. We remark the use of the word "should," instead of "would." We doubt it, and would like to know the result of an experiment. Then there are those tenants who may leave their houses at any time. These Mr. Gamlen says should be dealt with in the same way as those who lease their houses for only two or three years, with the exception that the depreciation should be somewhat lower. The wiring of cottages, held on monthly notice, it is suggested, should be done by the landlord, and a "slightly" higher rent charged for five years. We can see landlords wanting to get back the capital cost, interest, and depreciation well within five years; and the tenant would not be very amiable over the higher rent. The writer has a great belief in his scheme; and he is persuaded—apparently by considerations not born of experience—that, if the supply authorities would act as intermediaries between landlords and tenants, many of the difficulties inherent to wiring installations would disappear. We may be permitted to doubt it, with, to guide us, a long experience in these matters. Landlords usually wish to obtain for nothing from gas suppliers all that will be of benefit to their property. They are not likely to regard electricity suppliers from a different point of view.

Low-Temperature Heating Panels, &c.

We have had electrically heated clothes, carpets, table cloths, and other things; and now there are on the market low-temperature heating panels, mirrors, tapestry draught screens, and portable sheet-iron panels. These, it is suggested, will make a room comfortably warm without the use of any other heating medium. One cannot properly heat a room without one supplies sufficient heat to it; and one cannot have anything that is heated, whether to low or any other temperature, which has not a goodly proportion of that heat extracted from it if the surrounding air is at a lower temperature, and particularly if the area of the heating medium is large. But the theory is that these low-temperature panels radiate the electrically provided heat. The theory is stated thus by the "Electrical Review:" "If a large surface is raised a few degrees above the temperature of surrounding objects, it will pour forth a stream of heat large in cross section but of low 'head,' which passes through the air without heating it appreciably, but is in a great measure absorbed by any solid object in its path;" and, further, "diffusion is more economical than direct heating." Apparently the idea is that, if the person or persons occupying the room are in the direct path of the radiated heat (they must be careful that they are), they will feel so much warmth and comfort that they will not realize that the air about them is at a low temperature. Of course, a little warmth is better than no heat on a cold day. These low-temperature electric panels, &c., are being introduced by Messrs. Grierson, Ltd., who state that, with resistance conductors operating at temperatures between 140° and 170° Fahr., and a current consumption of ¾ to 1 unit, a room up to 16 ft. by (say) 14 ft. can be made comfortable for the occupants. How long the process takes is not stated; but from ¾ unit (2565 B.Th U.) to 1 unit (3420 B.Th.U.) is not in cold weather a large output of heat for a room 16 ft. by 14 ft. If the occupants really feel warm under such conditions, the panels, mirrors, &c., from their economy alone, should be the death of those voracious electric-fires, which require heating elements consuming 2 to 3 units of current for a room of that size in cold weather. The "Electrical Times" gives an illustration of the magical effect of these panels. It was found that, on a still day, with an outside temperature of 42° Fahr., typists could work quite comfortably the whole morning in an office heated by two panels, even with the windows open. In this case the panels measured 3 ft. wide by 8 ft. high. From the physical and physiological point of view, Mr. Grierson contends that this system is much to be preferred to radiators with wire elements working at a high temperature in a concentrated space, and considered also from the point of view of cost of operation, maintenance, and reliability. It is further said that these "low-temperature electric heating elements can, with perfect safety, be placed behind tapestries and mirrors, under floor coverings—such as carpets, marble, rubber, or linoleum; they can be embedded in plaster, and utilized in many ways too numerous to mention. They can be applied to articles of furniture with absolute safety in every respect." The electric element, it is stated, carries a guarantee for a period of twelve months. The last-named contemporary says it will watch the progress of the "Radio-Electric Panel" with much interest. So shall we. But if the "Electrical Times" wants a "tip," we should advise it to put its money on the open fire—gas-fires for preference. Inventors propose, but the public dispose, and alone can make success. The "Electrical Review" is quite optimistic. "The system," it says, "represents a notable departure from common practice and conventional ideas, so that much educational work will have to be done before public conservatism is overcome; but we believe it will have a great future." Already, it is stated, one large West-end firm have ordered over fifty low-temperature heating mirrors for their fitting-room.

Tubular Radiators.

With the same end in view, Mr. John Lightfoot, of Manchester, is of opinion he can do better than Messrs. Grierson. He has been experimenting for the past two years with the low-temperature system of heating rooms, but on different lines. He has adopted the same method as those utilized for steam and hot water. In other words, his invention consists of the combination of a suitable heating element with iron piping. Mr. Lightfoot describes his plan in a letter to the "Electrical Review." The pipes are run round the skirting-boards of the room, and, each length having its own switch, the room may be heated from three or four points as desired—thus causing "a complete distribution of heat over the whole room." The results, he says, have been extraordinary, as he has proved that with 0·6 watt per cubic foot of room capacity, he can give a minimum of 60° over the whole room. The system can be employed in various ways. Any section of rooms, Mr. Lightfoot states, can be warmed by tubular radiators, which he fits in recesses, bay windows, &c., or by portable radiators of the same type. He calculates the saving at approximately 60 p.ct. of the consumption of electric fires and radiators. The low-temperature heat in this tubular system is usually supplied at 150° on the outside of the pipe, which, in Mr. Lightfoot's opinion, is the correct heat to dissipate in the room to the best effect. The inventor does not say whether his 0·6 watt per cubic foot to maintain a temperature of 60° applies in the case

of any atmospheric temperature. When atmospheric temperatures are low, the temperature of the walls is low; and their heat-absorbing capacity is in inverse ratio to their temperature. On low-temperature days, the heating-up of a room would, it strikes us, be rather a slow operation at 0·6 watt per cubic foot of capacity, in view of the demands upon the heat. Are the rooms properly ventilated, with a constant change of air going on; or must they get into a stagnant and polluted state, in order to provide suitable conditions for these low-temperature electric heating processes?

Demonstration Houses.

Among their propaganda methods, several electricity undertakings are adopting the old-time expedient of gas undertakings of fitting-up a demonstration house with all sorts of appliances. We have read about this effort at business getting being applied at many places; but in most of them the demonstration is one of extravagance. Some are enough to frighten the would-be electricity user from further contemplation of the act of uneconomy. When he or she comes to count-up the cost of all that is seen, it is found a very long purse would be required to meet the first expense, without any information as to what it would all mean in operating cost and maintenance. But there are examples that are not so bad. In Glasgow the Corporation Electricity Department have fitted-up an "all-electric house," divided into four all-electric flats. "Magicoal" fires (which always seem to us to be highly deceptive things, rather than good heating arrangements) are fitted in all the rooms. Electric lamps, cookers, &c., are there; and accessories are electric bed-warmers, hair driers, and curling-tongs. Then at Manchester a so-called "all-electric" house has been equipped on the Catterick Estate, Didsbury. But it can only be viewed by appointment; and then the "lady of the house" attends to the demonstration of the appliances. The householder happens to be a member of the Department's own staff, so things are sure to be well done, and the equipment to be kept in first-class order. In this "all-electric" house, there is a coal-heated-range in the living-room; and the supply of hot water is said to be from this, but the supply is inadequate. It ought not to be, if the coal-heated range was large enough and the boiler fitted of sufficient capacity. The Department, however, get over this defect of insufficiency in equipment by adopting the hybrid system of introducing into the hot water storage cistern an electrically heated "Highlow" circulator of 4 KW. capacity, with a switch giving regulation to full, medium, or low heating rate. This dual method of doing one job means increased installation cost, and necessarily a high cost to produce the results required. An electric-cooker, a 2-pint kettle, and a washing-machine are in evidence. There is also an electric drying rack, consisting of an ordinary rack, fitted with brass tubes containing resistance heaters. The dining-table is a marvel. On the underside are several sockets for connecting plugs of an after noon tea kettle, a toaster, a table lamp, and a "Vio-Ray" high frequency tube for the treatment of various ailments. "Inventa" small portable heaters and a "Cosmos" bowl fire are used for occasional heating; and a 2 KW. Belling fire (which is said to have "a very attractive simulation of a coal-fire effect") is used to heat the small drawing-room. In the bath-room is found an electrically heated towel-rack; and the housewife has her Singer machine electrically driven. The lighting installation, we are informed, has been made "with economy rather than convenience as the prime consideration." In some respects, this demonstration house appears to be a bit overdone; but its title to being "all-electric" can be disputed. We see that householders in Manchester can have their supply on the bi-part system—the terms being 30 p.ct. of the pre-war rateable value of the house, *plus* ½d. per KW.-hour for the current consumed. The "Electrician," from which these particulars have been obtained, thinks that a system of charging of this kind will do more than anything else to encourage the "all-electric" house. Perhaps it is right. There is not much encouragement in other directions.

The Middleman and Retail Prices.

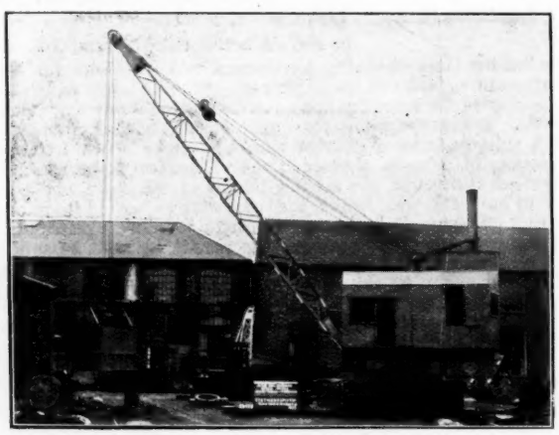
Good hopes and doubts are mixed as to whether the trading policy recently promulgated by the Electrical Contractors' Association will have the effects intended. They are to give the retailers of electrical appliances greater encouragement, and to lower the price of goods to the public. These doubts and fears will be generally shared, in view of the fact that there are so many interests to compose; and they will all be pulling in opposite directions to gain their own ends. People who have established business connections are not going to be dethroned without a good struggle. Co-operation between the manufacturer and the retailer is being sought; and the middleman, who naturally wants a picking in the way of profit, it is hoped to evict by more direct trading. This is not intended to apply to the genuine wholesalers who assist by carrying large stocks, and by supporting the manufacturer by considerable contract buying. Where and how the line is to be drawn, is not known. In a contributed article to "Electrical Industries," it is pointed out that instances are common where electrical goods costing a small sum are being sold at high prices to provide discounts to a number of middlemen who would be unnecessary were a proper trading policy in force. That may be quite true; but unless there is a covenant among the manufacturers not to supply those middlemen, or unless there is agreement among the retailers (large and small) not to patronize them, who is to evict them? They will continue to exist. And what form is discouragement of direct trading by the wholesaler with the user to take unless to this end there is loyal co-operation by the retailers in the way of refusal to trade with those who are found to transgress? The position is a difficult one to handle. The policy of offering larger discounts to encourage the retailer to purchase in quantity is a good one. But we are of opinion that the demand of the public is a greater influence in quantity buying than discounts

COAL AND COKE GRABBING STEAM CRANES

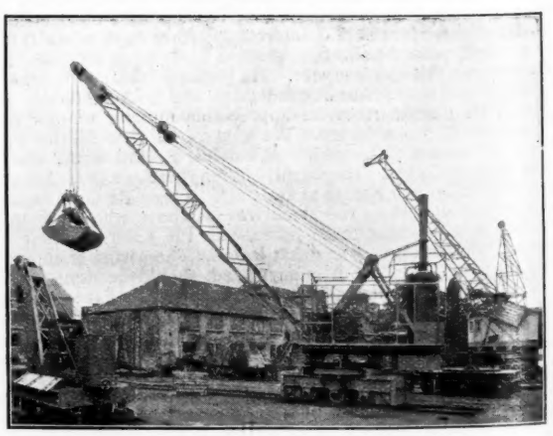
For the Swansea Gas Light Company's New Depot at Morriston.

THESE cranes are of special design arranged for working "four-rope" grabs and skips, for which purpose they are fitted with two rope barrels, each coiling double ropes in right and left hand grooves. The main hoist barrel is driven from the engines through double-purchase spur gearing. The ropes from this drum pass up over the jib and down to the grab barrel anchor pins. The second or "hold" barrel, is mounted loose on its shaft and is provided with a separate brake. The ropes from this drum pass up over the jib and down to the grab crosshead balance beam. The hold barrel shaft is driven from the main barrel by spur gearing; and a friction clip-slipping clutch is provided, which allows the "hold" ropes to pull out during the opening and closing of the grab, but which has sufficient grip to drive the hold barrel at the same speed as the main barrel when the grab is being hoisted. A powerful friction coil clutch is also fitted to the hold barrel to provide a positive drive when it is desired to lift or lower the grab with its jaws open.

The operation of grabbing is as follows: As the grab closes, the main barrel coils up its rope, while the hold barrel remains idle (except for the necessary pull-out, caused by the sinking of the grab as it closes into the material). As soon as the grab is completely closed, and when hoisting begins, the friction clip carries the hold barrel round at the same speed as the main barrel. The grab may then be slewed or lowered to any desired position for discharging its contents. The opening of the grab is performed by the crane driver applying the hold barrel brake and lowering out on the main barrel until the grab is fully open. The friction



The Steam Crane at the Morriston Works of the Swansea Gas Light Company, showing the Coke Skip.



The Steam Crane at the Morriston Works of the Swansea Gas Light Company, showing the Coal Grab.

coil clutch is then put into action, thereby coupling the hold barrel direct to the main barrel, so that the opened grab may be lifted, slewed, and lowered to take up another load. The coil clutch is then released, and the cycle of operations repeated.

The advantage of this double-barrel system of working is that it permits the discharging of the grab at any point in its range of lift without the use of a discharging ring, which would only release the grab at a fixed height. The four-rope system of suspension prevents the grab from spinning when the crane is slewed.

The coal crane illustrated is designed to deal with 280 tons per day of 7 working hours—*i.e.*, 20 cycles per hour, grabbing 2 tons of coal per cycle, and discharging it some distance from the stock heap. The following are the principal dimensions:

Maximum radius	50 ft.
Minimum radius	20 ft.
Maximum load at 50 ft. radius	5¼ tons.
Gauge of rails	4 ft. 8½ in.
Maximum wheel base	9 ft.
Length of jib	57 ft.
Diameter of roller path	9 ft. 6 in.
Size of boiler	4 ft. 6 in. dia. by 10 ft. high.
Working pressure per sq. in.	100 lbs.
Size of engines	9 in. bore by 12 in. stroke.

The crane is designed to do all its work on 4 ft. 8½ in. gauge without the assistance of outrigger girders or rail clips. The necessary stability is obtained by ballast weights under the boiler and in the undercarriage of the crane. The superstructure framing is built up of rolled-steel sections, carries the machinery, and is extended at the rear to carry the boiler, &c. Large-diameter steel rollers are provided at the back and the front of the superstructure, running on a combined cast-steel roller path and slewing rack. The slewing gear is fitted with a slipping clutch to prevent overloads on the teeth of the rack and its pinion when stopping and starting suddenly. Double friction cones are fitted for the slewing motion, so that the crane may be slewed in either direction without stopping or reversing the engines. All pinions, and the whole of the travelling gear wheels, are of steel, having machine-cut teeth. All rope pulleys are of large diameter and of the "Lawrence" patent self-oiling type manufactured exclusively by Messrs. Stothert and Pitt, Ltd.

The following speeds of the various motions were easily attained during the official tests at the makers' works, in the presence of Mr. W. H. Johns, of the Swansea Gas Light Company.

Lifting	5¼ tons at 200 ft. per min.
Slewing	5¼ tons at 1½ revs. per min.
Travelling	5¼ tons at 120 ft. per min.

The coke-grabbing crane is of similar design to the coal crane; the engines and gearing being interchangeable. The undercarriage is wider to suit the 12 ft. gauge of rails on the elevated ferro concrete gantry upon which it is to work. The maximum load and radius for this crane is 6 tons at 55 ft., with a 67-ft. jib.

The grabs for these cranes are of Messrs. Stothert and Pitt's patent construction, specially designed for handling coal and coke. The coal grab has an average capacity of 80 c.ft., and the coke grab a capacity of 150 c.ft.—*i.e.*, 2 tons in each case. The coke crane is also provided with drop-bottom skips of 2 tons capacity, operated in the same manner as the "four-rope" grabs. One of these skips is shown attached to the coal crane.

The design and construction of these cranes and their equipment is of an exceptionally robust character to meet the specified conditions of hard and continuous service in grabbing work. Similar cranes have been constructed by Messrs. Stothert and Pitt, Ltd., for gas-works service at Croydon, Portslade, and elsewhere, operated by electric power as well as steam.

FEDERATION OF GAS EMPLOYERS.

SCOTTISH DISTRICT.

The Annual Meeting of the District Executive Board for Scotland was held on Tuesday, May 29, in the City Chambers, Glasgow—Bailie Slorach, Hamilton, in the chair. The annual report of the Management Committee was submitted and approved. The report stated that no serious dispute or stoppage of work at gas-works in Scotland had occurred in the course of the year. The zoning and grading schemes continued to work smoothly. The work of the Regional Council had been harmonious; the workers' and employers' side exercising practical co-operation beneficial to both parties. The Council has been of great value in settling local disputes; and its existence is largely responsible for the cordial relationship existing between employer and employee.

The Management Commitee for 1923-4 was elected as follows:

Chairman—Bailie Slorach, Gas Convener, Hamilton.
Vice-Chairman—Alex. Yuill, Dundee.
Secretary—J. W. Napier, Alloa.

Messrs. Samuel Milne (Aberdeen), L. Hislop (Cowdenbeath), George Keillor (Greenock), James Dickson (Johnstone), David Vass (Perth), George Braidwood (Coatbridge), J. M. Smith (Stirling), John Lang (Alexandria), T. W. Harper (Ayr), H. H. Gracie (Edinburgh), J. W. Napier (Alloa), and Capt. Kennard (Falkirk).

Bailie Slorach, and Messrs. George Braidwood, John Lang, J. W. Napier were elected as representatives on the Central Committee.

INSTITUTION OF GAS ENGINEERS.

ANNUAL REPORT OF THE COUNCIL.

The Council have issued to the members their report upon the work during the year 1922-23.

MEMBERSHIP.

At the end of the year 1922 the total of all classes on the roll was 977, against 954 for the year before, an increase of 23.

TRANSFERS AND STUDENTS.

The names of those transferred from the class of associate member to that of member are as follows: Douglas Cleave Cross, Lea Bridge, James Jamieson, Edinburgh, Frederick S. Smith, Reigate, and Harold M. Tysoe, Maltby. The following have been admitted as students during the year: Charles Bateman, Cardiff, Reginald E. Gibbins, Tottenham, Alfred D. Parkyns, Exeter, Jack Parrett, Exeter, Joseph F. Smith, Leamington, and Bertram N. Wells, Margate.

DEATHS.

The Council regret that the deaths of the following have to be recorded: Wm. T. Buckland, Chesterfield, S. E. Figgis, Melbourne, James W. Helps, Croydon, George R. Hislop, Paisley, C. E. Jones, London, G. Nakagawa, Tokyo, James Randall, Tottenham, Frederick Turner, Birmingham, W. A. White, Sheffield, and George Winstanley, Coventry. Mr. Hislop was one of the oldest members of the Institution, having been elected in the year 1872. Mr. James W. Helps rendered valuable service for a number of years in the organization and development of the industry. In recognition of his work, the "Birmingham Medal" was awarded to him in 1905. He served as Hon. Secretary of the Institution for some years, and in 1910 was President.

THE THERM INQUIRY.

A Departmental Committee were appointed by the President of the Board of Trade "to inquire and report as to the method of charging for gas on a thermal basis." Evidence was given by the President of the Institution (Mr. James D. Smith) and by Mr. Samuel Tagg (Vice-President). The recommendations in the report of the Committee, dated Feb. 19, 1923, are as follows:

(1) That the method of charging for gas on the therm basis should be continued and extended to all statutory gas undertakings within the scope of the Gas Regulation Act; and

(2) That the Board of Trade should consider what are the best means to employ in order to ensure:

(*a*) That all gas undertakings charging for gas by the therm shall supply to each ordinary and prepayment consumer a meter card whereon shall be clearly stated, in addition to the date of reading and the indication of the meter, the current declared calorific value, the number of cubic feet registered by the meter, and the number of therms consumed calculated at the declared calorific value; and

(*b*) That until such times as consumers are familiar with the new method of charge, on the face of all gas invoices and prepayment receipts there shall be indicated the consumption in cubic feet, as well as in therms, and the charge per 1000 c.ft. equivalent to the charge made per therm, and, in addition, the declared calorific value of the gas supplied.

NATIONAL GAS COUNCIL.

The Institution have been represented on the Central Executive Board of the National Gas Council during the year 1922-23 by Mr. Thomas Goulden, Mr. James Paterson, Mr. James D. Smith, and Mr. Samuel Tagg.

AFFILIATED DISTRICT ASSOCIATIONS.

The District Associations affiliated with the Institution have been represented on the Council for the same period by the following:

Eastern Counties Association	Mr. H. G. Ruggles.
Manchester District Institution	Mr. E. H. Hudson.
Midland Association	Mr. W. H. Adams.
North British Association	Mr. C. Fairweather.
North of England Association	Mr. F. C. Willis.
Southern Association	Mr. J. M. Campbell.
Wales and Monmouthshire District Institution	Mr. James Robb.

ANNUAL GENERAL MEETING.

The annual general meeting of the Institution was held at the Institution of Electrical Engineers, Victoria Embankment, on June 20, 21, and 22, 1922, under the Presidency of Mr. Thomas Hardie, M.Inst.C.E., Chief Engineer of the Gas Light and Coke Company. The Institution had the great honour and pleasure of officially welcoming the President (M. Robert Ellissen), and a number of the members of the Société Technique de l'Industrie du Gaz en France, on the occasion of their visit to London, which had been postponed from the previous year owing to the coal dispute.

EDUCATION OF GAS ENGINEERS.

A special meeting of the Institution was held on Feb. 14, 1923, when the scheme for the education and certification of

gas engineers, which had been approved by the Board of Education and the Council, was presented and unanimously adopted. Arrangements are being completed to bring the scheme into operation in the winter session of 1923-24. The Council confidently appeal to every member of the Institution to do all in his power to encourage the juniors to prepare for the examinations. The success of the scheme will depend on the hearty co-operation of administrators and other well-wishers of the industry. Mr. Walter Hole, who has done so much in the preparation and development of the scheme, has been appointed Organizing Secretary. A joint conference on education in the gas industry, arranged by the Institution and the British Commercial Gas Association, was also held on the above date, at which an account of what is being done in various industries was given by Mr. R. W. Ferguson, M.A. (Hon. Secretary of the Association for Education in Industry and Commerce).

STANDARD GAS-VALVE FLANGES.

As the result of conferences with the Society of British Gas Industries, a new set of standards for gas flanges has been jointly approved. It has now been submitted to the British Engineering Standards Association for adoption.

STANDARD CONDITIONS OF CONTRACT.

The Council have also been in communication with the Society of British Gas Industries on the question of the restoration of the original figures in Clause XXVII.—Payment. It has been agreed to revert to the original payment terms which were in force before the war.

TESTING GAS-OVENS.

A Sub-Committee of the Gas Investigation Committee have been formed for the consideration of proposals for the standardization of tests for gas-ovens, under the chairmanship of Mr. A. E. Broadberry. Mr. Arthur Forshaw, M.Sc. (Manc.), F.C.S. (late Institution Gas Research Fellow), has been appointed Chemist for this work; and preparations for the requisite tests have been placed in hand.

BRITISH REFRACTORIES RESEARCH ASSOCIATION.

Mr. A. E. Broadberry and Mr. W. E. Price have continued as the representatives of the Institution on the Council of the British Refractories Research Association during the past year. Now that the financial difficulties have been overcome, it is hoped that the rate of progress of the work of the Association will be accelerated.

REFRACTORY MATERIALS JOINT COMMITTEE.

This Committee, consisting of representatives of the Institution and the Society of British Gas Industries, during the year have completed the revision of the Standard Specification; and a new edition has been published. At the forthcoming annual meeting of the Institution, it is proposed to submit reports on the following: (*a*) Test under load of various materials, emphasizing the relation between the ordinary refractory test and the load test; (*b*) tests on "Sillimanite" materials, including the manufacture of gas-retorts, and testing them in practical use; (*c*) tests on carbonized clays; (*d*) chemical analysis and the preparation of clays by purification and/or adding ingredients to enhance their fire-resisting qualities.

LIFE OF GAS-METERS JOINT COMMITTEE.

This Committee, representing the Institution and the Society of British Gas Industries, have now practically concluded their labours. Meetings have been held during the year to consider special matters. These had reference to materials used in the construction of meters, and some cases of gas-works corrosion which the Chemist (Mr. J. G. Taplay) had in hand. A report will be presented at the forthcoming meeting of the Institution, consisting mainly of a retrospect of the work of the Committee since their inception in the year 1914.

BIRMINGHAM MEDAL.

The Council have awarded the Birmingham Medal to Mr. W. Doig Gibb, O.B.E., M.Inst.C.E., in recognition of the invaluable services he has rendered the gas industry in various ways, particularly during the war. Arrangements have been made for presenting it at the forthcoming meeting of the Institution in Belfast.

BRITISH EMPIRE EXHIBITION, 1924.

The Institution were represented at several meetings held to consider preliminary arrangements for the organization of a Gas Section in connection with the British Empire Exhibition of 1924. Ultimately a meeting of representatives of the British Commercial Gas Association, the Gas Companies' Protection Association, the Institution of Gas Engineers, the National Gas Council, and the Society of British Gas Industries was held, when it was resolved that the gas industry be represented at the Exhibition. A Committee were appointed for raising the necessary funds, and for planning and carrying out the exhibit.

NATIONAL GAS EXHIBITION AT BIRMINGHAM.

The patronage and support of the Institution are being given to the National Gas Exhibition to demonstrate the service of gas in home and industry, which is to be held at Bingley Hall, Birmingham, from Sept. 17 to Oct. 3 next.

GAS INVESTIGATION COMMITTEE.

The Joint Committee on Gas Heating, Lighting, and Ventilation Research of the Institution of Gas Engineers and the University of Leeds have continued to act as Research Sub-Committee for the Gas Investigation Committee of the Institution. Since the issue of the last report, following the Council's annual revision of the various Committees and Institution representatives, Mr. J. H. Brearley has ceased to be a member of the Committee. He was responsible for very valuable work in connection with the investigation of gas-heating problems, and was an original member of the Committee. His fellow-members would like to express their thanks to him for the services he has rendered, and his loyalty as a colleague. The staff engaged upon research work have been changed by the appointment of Dr. A. C. Monkhouse in place of Mr. F. S. Townend, who has gone on the technical staff of Sir Arthur Duckham. Investigation has been continued in several directions.

Mr. James W. Wood, assisted by Mr. G. B. Howarth, has been occupied in making a careful study of the "Fairweather" recording calorimeter, and this matter being regarded as urgent, a report detailing the results obtained was placed before the Gas Investigation Committee and adopted on Dec. 11, 1922. A further examination of some details has followed. A continuation has also been made of the work commenced in the previous year on the aëration in atmospheric burners, mainly a study of injector action; and a report on this subject will be forthcoming at the June meeting. Mr. Wood's work is now being carried out in a laboratory at the Meadow Lane Works of the Leeds Corporation Gas Department; and thanks are expressed to the Department and to Mr. C. S. Shapley (the General Manager) for the facilities which they have provided.

Dr. A. Parker, with the assistance of Mr. H. Kerr, Dr. A C. Monkhouse, and at times Mr. G. B. Howarth, has been continuing work on the water-gas process at Birmingham. The chemical results obtained in the carburetted water-gas plant at Windsor Street have been examined in much more detail than was possible before the issue of the last report; while at Adderley Street an examination has been made of the effect of altering some of the existing conditions of operation of the blue water-gas plant, mainly the depth of the fuel bed. The Committee take this opportunity of again expressing their thanks to the Birmingham Corporation Gas Department and the staff for the facilities and help they have continued to provide, and would also like to place on record once more their appreciation of the loyal and valuable services rendered by their own staff, particularly the two chief Research Chemists—Mr. J. W. Wood and Dr. A. Parker.

CORBET WOODALL SCHOLARSHIP.

An election was made to the Scholarship, in June, 1922, in the person of Mr. Alexander G. Grant, who entered upon his studies at the University of Leeds in October, and will take his intermediate examination for the B.Sc. degree in Gas Engineering in June. Mr. Grant had an excellent school record at the Nuneaton Grammar School and Penzance County School, and has already some knowledge of gas manufacture gained at the Nuneaton and St. Ives (Cornwall) Gas-Works; his father being Engineer and Manager of the latter.

LIVESEY MEMORIAL PROFESSORSHIP.

The Professorship continues to be held by Prof. Cobb in the Department of Coal Gas and Fuel Industries in the University of Leeds. As in previous years, teaching and research work have been carried on, the former specially directed towards the training of students for the profession of gas engineering.

The special course on the principles of gas distribution has been given this year by Mr. Stephen Lacey (Distribution Engineer of the Gas Light and Coke Company), in place of Mr. Walter Hole, who has given the course with great success since the time it was first instituted, but found continuation impossible on the removal of his residence from Leeds to Torquay.

Investigation on fuel questions through the Gas Heating, Lighting, and Ventilation Research Committee and other channels continued, and most of the results have been reported to the Institution. Research on refractory materials has been in the hands of Mr. H. G. Houldsworth, the Research Assistant appointed for the purpose, and has yielded interesting results, which have been reported to the Refractory Materials Section of the Ceramic Society.

The Joint Benzole Research Committee of the University of Leeds and the National Benzole Association are now active, and have had a number of meetings. A brief report on the results obtained by Mr. E. C. Williams (the Research Chemist) has been submitted to the National Benzole Association.

The new experimental gas plant which is being provided by Mr. Henry Woodall, and in connection with which others have rendered valuable assistance, is now nearing completion.

GAS RESEARCH FELLOWSHIP.

Dr. A. C. Monkhouse, who had done useful work during his tenure of the Fellowship, resigned it in order to take up an appointment on the staff of the Gas Heating, Lighting, and Ventilation Research Committee. He has been succeeded by Mr. Stuart Pexton, M.Sc., who has been continuing an investigation which he had already commenced on the gasification of coke in steam, with special reference to nitrogen and sulphur. This work is substantially an extension of that carried out by Dr. Monk-

house; and the results will be reported in the form of a joint paper by Mr. Pexton and Prof. Cobb at the forthcoming meeting of the Institution. The conditions governing the gasification of fixed carbon are regarded as of increasing importance to the gas industry.

NATIONAL ILLUMINATION COMMITTEE OF GREAT BRITAIN.

The report for the year 1922 of the Chairman of this Committee, on which the Institution are represented, is reproduced.

[This, with the appendix, will be found in the "JOURNAL" for April 18 last, p. 165.]

INTERNATIONAL AIR CONGRESS.

Sir Dugald Clerk, K.B.E., Past President, has been appointed to represent the Institution on the Council of Honour of the International Air Congress, which is to be held in London from June 25 to 30, 1923.

CONJOINT BOARD OF SCIENTIFIC SOCIETIES.

The Council have to report that this Board, of which the Institution was a constituent member, has now been dissolved.

EXAMINATIONS IN GAS-FITTING.

A conference of local examiners in the subject of "Gas-Fitting" of the City and Guilds of London Institute Examinations (arranged by the Chief Examiner, Mr. R. J. Rogers) has been held. The following recommendations submitted by them have been approved: (*a*) That the conditions of entry to the Grade 2 and to the Final Examination be continued as they stand at present. (*b*) That it is desirable and practicable to have the work of each final candidate examined on the district. Arrangements were also made for the holding of a separate *viva voce* examination for each candidate.

LIBRARY.

The list of donations to the library which have been received during the past year is given in an appendix circulated with the report; and the Council desire to express their thanks for them. Gifts of works of interest on any branch of gas engineering which members and others may be able to contribute are always appreciated.

ACCOUNTS.

Appended to the report are the accounts for the year ended Dec. 31, 1922, duly certified by the Auditors (Mr. Sydney Y Shoubridge and Messrs. Wood, Drew & Co.).

JAMES D. SMITH, *President.*
W. T. DUNN, *Secretary.*

June 8, 1923.

THE BENEVOLENT FUND.

In presenting their annual report on the working of the Fund, the Committee of Management state that during that period eleven cases were assisted, the amount expended in their relief being £345 14s. The number of cases was the same as in 1921, when £281 11s. was expended. The total expenditure on income account for 1922 amounted to £405 2s. 4d., as against £310 18s. 5d. for the year before.

Income for the year 1922 amounted to £517 16s. 4d., of which £106 was derived from donations, and was invested. Annual subscriptions produced £259 12s. 6d., as against £252 2s. in 1921; interest on investments, £112 2s. 7d., as against £90 6s. 9d. the year before; refundment of income-tax, £36 2s. 3d., in place of £31 13s. 6d.; and interest on deposit account, £3 19s., as against £8 19s. 9d. for the previous year. Compared with 1921, subscriptions and donations together show a decrease of £35 16s. 8d., while the amount granted in relief was increased by £64 3s. The Committee acknowledge with much appreciation the donation of £50 from Sir Robert S. Gardiner, as also the annual donations from various District Associations and others.

A copy of the accounts duly audited, and full list of subscribers and donors for the year 1922, is appended to the report.

The number of cases now receiving assistance from the fund (May, 1923) is twelve.

In order to ensure an adequate income for maintaining the existing grants, and to meet further calls which may be made, it is desirable that the number of annual subscribers should be increased. It may be pointed out that, although the total membership of the Institution is 986, the number of subscribers is only 391. The Committee, therefore, sincerely appeal to those who have not yet become subscribers to allow their names to be included in the list for the year 1923. Their help will be greatly valued.

Mr. John W. M'Lusky, of Glasgow, and Mr. J. Wesley Whimster, of Bath, are the two members of the Committee of Management who now retire in order of rotation after three years of service. To succeed them the Committee have nominated for election at the forthcoming annual meeting Mr. Archd. Kellock, of Airdrie, and Mr. P. S. Hoyte, of Plymouth.

Modern Gas Producers.—Messrs. Benn Brothers, Ltd., have sent to us a copy of their latest publication—"Modern Gas Producers," by N. E. Rambush. This volume, a review of which will shortly appear in our columns, is another addition to their well-known series of books relating to the gas industry. The price is 55s. net.

INSTITUTION OF GAS ENGINEERS.

AGENDA FOR THE ANNUAL MEETING.

The following agenda have been prepared for the annual general meeting, to be held in the City Hall, Belfast, on Tuesday, Wednesday, and Thursday, June 26, 27, and 28, under the presidency of Mr. James D. Smith, M.Inst.C.E., Engineer and Manager of the Belfast Corporation Gas-Works.

Advance copies of the reports and papers are being prepared for issue to members making application for them.

Tuesday Morning, June 26, at 10 30 a.m.

The chair will be taken at 10.30 a.m.

The Rt. Hon. the Lord Mayor of Belfast (Alderman W. G. Turner, J.P.) will welcome the Institution.

Minutes of the last Annual General Meeting to be submitted for confirmation.

Appointment of scrutineers for the examination of balloting lists for election of Officers and Council, members, and associate members.

Presentation of the Birmingham Medal to Mr. W. Doig Gibb, O.B.E., M.Inst.C.E.

Address of the President.

Annual report of the Council, and accounts for the year ended Dec. 31, 1922.

Revision of Article 40 with reference to mode of election of Officers and Members of Council.

Eighth Report of the Gas Investigation Committee. "Fair-weather" Recording Calorimeter.

Discussion of the Eighth Report.

Ninth Report of the Gas Investigation Committee. Aëration in Atmospheric Burners.

Discussion on the Ninth Report.

(Adjournment at about 1 p.m.)

Tuesday Evening, at 7.30 p.m.

Reception in the City Hall, by invitation of the Rt. Hon. the Lord Mayor of Belfast and Lady Mayoress.

Wednesday Morning, June 27, 10.30 a.m.

The chair will be taken at 10.30 a.m.

Annual General Meeting of the Benevolent Fund.

AGENDA.

Minutes of the last Annual General Meeting to be submitted for confirmation.

Annual report of the Committee of Management for the year 1922-23, and accounts for the year ended Dec. 31, 1922.

Announcement of election of two members of Committee of Management to succeed those retiring in order of rotation.

Other business.

After the meeting of the Benevolent Fund, the meeting of the Institution will be resumed.

Institution Meeting.

Paper on "The Flow of Gas in Pipes," by Mr. Stephen Lacey, of London, and discussion.

Tenth Report of the Gas Investigation Committee. Further examination of the Blue and Carburetted Water Gas Processes.

Discussion on the Tenth Report.

Report of the Institution Gas Fellowship. "The Gasification of Coke in Steam, with special reference to Nitrogen and Sulphur," by Mr. Stuart Pexton, M.Sc. (Institution Gas Research Fellow), and Prof. J. W. Cobb, C.B.E., B.Sc., F.I.C. (Livesey Professor).

Discussion on the Report.

(Adjournment at about 1 p.m.)

Wednesday Afternoon, at 1.30 p.m.

Luncheon at the City Hall by invitation of the Chairman of the Corporation Gas Committee, Councillor Frank Workman, D.L.

3.30 Special tramcars leave the City Hall for visit to the Gas-Works, Ormeau Road, by invitation of the Gas Committee. Inspection of seven-million spiral-guided holder.

By courtesy of the Corporation Tramways Committee, the city tramcars will be available for free use at any time during the meeting on production of special passes, which will be provided.

Wednesday Evening, at 8.0 p.m.

Lecture on "The Flow of Gas," by Prof. W. B. Morton, M.A., in the Physics Lecture Theatre of Queen's University, University Road, near the Botanic Gardens.

Thursday Morning, June 28, 10.30 a.m.

Paper on "Distribution in Belfast," by Mr. A. M'I. Cleland, of Belfast, and discussion.

Paper on "Ammonia Yields from Vertical Retorts," by Mr. George Braidwood, of Coatbridge, and discussion.

Report of Refractory Materials Committee, introduced by Mr. A. E. Broadberry, Chairman of the Committee: (*a*) Refractoriness under load. (*b*) Fortifying refractories with

sillimanite. (*c*) Carbonized clays. (*d*) Is the purification of fireclays worth while?
Discussion on the report.
Report of the Life of Gas-Meters Committee.
Discussion on the report.
Nomination of the respective Presidents of the American, French, and Italian Gas Associations, and of Mr. Bernard R. Parkinson, M.I.Mech.E., for election as honorary members of the Institution.
Scrutineers' report.
Place of meeting next year.
Votes of thanks.

Thursday Afternoon, at 3.0 p.m.

Special tramcars leave City Hall for visit to Bellevue Gardens, Glengormley.

Friday, June 29.

Visit to the Giant's Causeway.

Tickets from Belfast (to be obtained from the Secretary not later than June 21), exclusive of wine, 15s. each.

a.m.
8.30 For members staying at Newcastle, Co. Down, train leaves Newcastle (Belfast and County Down Railway).
9.30 Arrives Belfast (Queen's Quay).
9.29 For members staying at Larne, train leaves Larne for Greenisland to join special train for Portrush.
10. 0 Special train leaves Belfast (York Street, Midland Railway).
11.42 Arrives Portrush.
11.50 Depart by electric tramway for Giant's Causeway.
p.m.
1. 0 Arrive Giant's Causeway. Luncheon at Giant's Causeway Hotel for Section A.
1. 0 Section B visit the Causeway.
2. 0 Luncheon at Giant's Causeway Hotel for Section B.
2. 0 Section A visit the Causeway.
4. 0 Afternoon tea. Photograph.
4.30 Depart from Giant's Causeway by electric tramway.
5.45 Arrive Portrush.
5.55 Train leaves Portrush.
7.35 Arrive Belfast (York Street Station, Midland Railway).

COMPARISONS OF SOME METHODS OF RUNNING WATER-GAS PLANT.*

This technical paper is a record of experiments at H.M. Fuel Research Station carried out on a Humphreys and Glasgow blue water-gas plant of a nominal capacity of 500,000 c.ft. per day. The plant is of the same type as the one investigated by the Gas Investigation Committee of the Institution of Gas Engineers; the report of these tests—which constituted the most thorough and reliable research in water-gas production which had been made—being presented in October, 1921. In the latter case, the method of working which was adopted was that recommended by the makers of the plant; a deep fuel bed being employed. In the recent tests at Greenwich, the Dellwik-Fleischer system was adopted in several of the trials. In this, as is well known, a comparatively thin fuel bed is used with a large grate area, so that with a powerful air blast the fire is heated-up rapidly by the combustion of the carbon almost completely to carbon dioxide.

A feature of some interest, concerning the formation of clinker, is mentioned in the introduction to the report. Durham coke (made in horizontal retorts), as supplied by the South Metropolitan Gas Company, gave very little trouble in the generator; while the coke obtained by the carbonization of the same coal at 1350° C. in the vertical retorts of the Fuel Research Station gave rise to considerable nuisance due to clinkering. This may perhaps be traced to a difference in the physical structure of the two cokes. In the earlier days of running the plant, when using vertical-retort coke, the generator became completely choked on some occasions. At a later period it was decided to line the clinkering doors with firebrick, and so prevent the passage of air and steam between the deadplate and the door. This alteration proved completely successful in preventing the accumulation of masses of clinker over the doors. The efficiency and capacity of the generator are said to have been improved by this simple alteration.

It will be remembered that in the report of the Gas Investigation Committee, trouble was experienced by the deposition of a finely-divided dust, which passed through the scrubber and relief holder; and in the early stages of the work at the Fuel Research Station, the same deposition of dust took place. Sometimes it was found in the form of a grey sludge in the service-pipes, but more often it appeared as a fine white powder in the meter-outlets, in the bends of pipes, and encrusted on the burners and brickwork of the retorts. On analysis it was shown to consist for the most part of silica; 75 p.ct. being present. To obviate this nuisance, a rectangular tank was built, in which a large number of wooden baffle plates were placed. A constant level of water was maintained which ensured a moist condition of the gas; and the wood surface exposed was 1960 sq. ft. The box was introduced between the holders and the distributing main, and was found to remove about 85 p.ct. of the dust from the gas.

The investigation was confined to tests on a fuel bed 7 ft. in thickness, and one in the neighbourhood of 3·5 ft. Three different variations of the Dellwik-Fleischer system were tried, in all of which the cycle was principally one half-minute blow to six minutes gas making. In the first test, a 3 ft. 6 in. fuel bed was used, with 10 lbs. of steam per minute; and a double blow was given after each charge of coke. In the second test the steam was reduced to 8 lbs. per minute; and two additional double blows were introduced at equal intervals during the period. In the third test the steam supply was again 8 lbs. per minute; the depth of the fuel bed being increased to 4 ft., and only one additional blow being given. The results indicated the presence of a considerable excess of steam in the first variation of the system, which resulted in a low efficiency. This was improved in the second case and, to a slightly greater extent, in the third. In these tests a uniform supply of coke was used, and, in each, weight and thermal balances were prepared. The best over-all efficiency obtained for the Dellwik-Fleischer system was 56 p.ct., and that for the deep fuel bed 54·9 p.ct. The former figure, it is stated, would probably have been about 5 p.ct. higher in a suitable generator large enough to produce gas at the same rate as it was produced in the case of the latter efficiency.

The temperatures prevailing in the system were carefully studied; and graphs were constructed to show the variation of temperature of the water gas and blow gas leaving the generator during one complete charging-to-charging period. Where no changes are made in the cycle, the regularity of these graphs is remarkable; and where changes do occur the effect of these is indicated very clearly. In particular, the results of any increases in the time of blowing are most marked. It is also brought out in these graphs that the heat generated during the blow was sufficient to overcome the cooling effect of the steam and the steam-carbon reaction, and to cause a slow heating-up of the whole generator. The effect of any further variations in similar cycles could be most readily traced by means of graphs of this nature.

Of course, thermal efficiency is not the only factor to be considered in water-gas manufacture; and although the efficiencies of the trials when the Dellwik-Fleischer system was in operation are higher than those obtained in the tests at the Adderley Street works of the Birmingham Gas Department, it is noticeable that the calorific value of the gas obtained is considerably lower—in one case to the extent of 30 B.Th.U. per c.ft. This may be attributed to the higher quantity of inerts in the gas from the shallow fuel bed.

It is to be noted that the figures of 56 p.ct. and 54·9 p.ct. for the over-all efficiencies of the plant in the two cases are calculated on the assumption of an efficiency in the electrically-driven fan of 14 p.ct. on coke. The figure actually realized at the Research Station was only 7·25 p.ct., and would lower the above efficiencies to 54·3 p.ct. and 53·8 p.ct. respectively. If, on the other hand, a steam-turbo blower of an efficiency of 5 p.ct. were employed, the figures would be further reduced to 52·8 p.ct. in each case.

This short survey embraces most of the important points of the research, more than which it is impossible to do. The report is well presented, and is valuable; but it does not carry us very far. Although purely a minor point, we would draw attention to an error in the figure given for the heat units in the coke fed to the generator in test No. 1, System A.

* Fuel Research Board. Technical Paper No. 6. "Comparisons of Some Methods of Running Water-Gas Plant," By J. C. King, B.Sc., A.R.T.C., F.I.C., and Engineer-Captain J. Fraser-Shaw, R.N. Copies obtainable at H.M. Stationery Office, Imperial House, Kingsway, W.C. Price, 2s. net.

Gummy Deposits in Meters.

The question of meter deposits was dealt with at some length by Mr. W. H. Fulweiler, Chemical Engineer to the United Gas Improvement Company of Philadelphia, in an East Coast Conference address. He expressed the opinion that "gums" have always been made, but that in the old days of illuminating standards the presence of condensable benzole and toluole kept them in solution. To-day, with less benzole and toluole in the gas, there is a greater tendency for the gums to form hard sticky layers. He cites, according to the "American Gas Journal," the case of a meter that was sealed and put in storage, and which happened to be discovered just ten years later. Ten years ago they were supposed not to have had any trouble with gum; but when this meter was opened-up, it was almost solid with it. This went to prove they were always making gum; but in the old days there were sufficient light oils present to keep it in solution, when it would not give any trouble. His Company have endeavoured strenuously to correlate plant operation with meter troubles; and the net result has been as follows: In the plants that had the lowest proportion of bad meters—that is, less than 2 p.ct.—there was a meter temperature of 82° Fahr.; and it was calculated that the average time of the gas in the holder was 6·4 hours. The plants which had the greatest trouble from meters—that is, in the vicinity of 9 p.ct.—had a meter temperature of 92° Fahr.; and the gas remained in the holder 3·3 hours. The gas, he went on, appears to-day to receive somewhat less condensation in the plant, with a resulting tendency to higher meter temperature. Owing to the increased output, the mains no longer have the same condensing capacity. The consequence of this is that there are being sent forward to the meters larger quantities of the unsaturated hydrocarbons which may form gums. There is no conclusive evidence that more of these unsaturated hydrocarbons are being formed under present operating conditions than was the case in the past.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

Visit to Plymouth.

ONCE again, those concerned are to be congratulated and thanked for the excellence of the arrangements made for the summer visit of the Southern Association of Gas Engineers and Managers. This year it was to Plymouth, at the invitation of the Chairman and Directors of the Plymouth and Stonehouse Gas Light and Coke Company, of which the Association's President, Mr. Percy S. Hoyte, A.M.I.Mech.E., is Engineer. The first item on the programme was a meeting of the Western District, to which members from the East were invited, last Thursday afternoon; and in the course of the day some fifty members, many of them bringing their wives in response to the cordial invitation extended, arrived and found comfortable quarters in one or other of the excellent hotels. Devon is a beautiful county, and Plymouth is a very fair city; and neither belied its reputation, for on Thursday the sun showed that it had not forgotten how to shine, and the majority of those present accepted the compliment and found their way to the Hoe as soon as possible. On Friday a notable absentee, for a Southern Association meeting, was the Clerk of the Weather; but his Deputy struggled hard to meet the case, and only gave up the task about 6.30 p.m. However, this late rain in no way damped the spirits of the party, and another charming visit has to be recorded.

An early opportunity was offered of meeting the President and Mrs. Hoyte, who entertained them to tea upon their arrival for the District Meeting; and during the evening Mr. and Mrs. Hoyte were assiduous in looking to the comfort and enjoyment of all. Among those present were Mr. W. Doig Gibb, Mr. W. H. Bennett (Hon. Secretary of the Association), and Mr. L. J. Langford, of Tunbridge Wells (Vice-President). Mr. W. N. Townsend (Past-President of the Eastern Counties Gas Managers' Association) and Mrs. Townsend were also present. All were presented with a souvenir book artistically illustrated and descriptive of the charms of Plymouth and its environs.

THE GAS-WORKS.

On Friday morning at ten o'clock the members assembled at the Royal Hotel and were conveyed by motor coaches to the works of the Plymouth and Stonehouse Gas Light and Coke Company, where they were received by Mr. Hoyte and his staff—Messrs. H. C. Widlake and R. J. H. Clark (Assistant Engineers), and Mr. L. P. Ingram. The annual output of the works is little short of 1600 millions; nearly 40,000 consumers being supplied with 450 B.Th.U. gas at 7d. per therm. In the tour of inspection no one was disappointed, though it may be said that it had been keenly looked forward to, in view of features of unusual interest which had been described in the President's address in March and in the Technical Press. A departure from stereotyped procedure was evidenced in the activities of a "snap" photographer, two of whose results we are able to reproduce. On their arrival at the works, pamphlets were distributed among the members containing a brief description of the plant to be seen at various points indicated on the ground-plan incorporated.

The route led first to No. 1 holder, on which is fitted the line and drums whose operation causes the height of the top lift to be recorded on ammeters in the new booster house. The instrument was described and illustrated in the Presidential Address [see "JOURNAL," Vol. CLXI., p. 826], and its ingenuity and utility were much commented upon. The new booster, governor, and meter house, now nearing completion, was an item dealt with at length in the Presidential Address; and the old booster house, which will shortly be demolished, was next inspected. It contains one large booster by the Sturtevant Engineering Company, direct-coupled to a 24-B.H.P. electric motor. Running at a speed of 1850 r.p.m., it is capable of setting up a differential pressure of 7 in., when handling 550,000 c.ft. of gas per hour. At times of heavy demand the whole of the gas taken from the holder outlets is boosted by this machine. Also there are two small Sturtevant boosters each direct coupled to a 9-B.H.P. electric motor, and which at 3000 r.p.m. are each capable of setting up a differential pressure of 12 in. when handling 140,000 c.ft. of gas per hour. These can be used either singly or in tandem, and boost the supply to Mutley, a very large suburb lying to the north of Plymouth. These machines are run in the light of the information afforded by the long distance pressure indicator fitted on the booster house wall. This was the first such indicator to be used, and it has been in continuous service since 1920—registering the pressure 2 miles away.

In the power station were seen two steam-driven exhausters—one by Messrs. G. Waller, and one by Messrs. Bryan Donkin—working on No. 1 retort-house, and the two main electrical generating sets. One is a 250 KW. 365-B.H.P. compound set by Messrs. Allen, of Bedford, and one a 138 KW. 220-B.H.P. compound Bellis-Siemens. These are supplied from the adjacent battery of three 30 ft. by 8 ft. Lancashire boilers (with two water-tube boilers as standby) fired on coke breeze. Direct current is generated at a pressure of 220 volts, and is distributed to the works by six independent feeders, *via* the distribution switchboard in the engine-room. The current generated is measured by an electrolytic meter, and amounts to nearly one million units per annum.

The party then proceeded to No. 1 retort-house, adjacent and parallel to which is the main coal store into which the coal from the wharf 500 yards away is brought by steam wagons. After being crushed, the coal is elevated on to a central running band conveyor, which distributes it at the rate of 100 tons per hour. Slightly under the level of this conveyor is a continuous telpher track accommodating a grab machine by Messrs. Strachan and Henshaw. This machine is chiefly used for feeding the crusher hoppers of the three elevators which raise the coal into the retort-house, where it is distributed by means of a reversible pushplate conveyor. This retort-house, built in 1894, contains 22 settings of 9 retorts (23 in. by 16 in.), and has a maximum capacity of 3½ millions per day. The settings are served by a pair of two-motor Fiddes-Aldridge machines. The coke is ejected from the retort into skips which are hoisted and removed through both ends of the house by a Strachan and Henshaw telpher

AN UNCONVENTIONAL GROUP NEAR THE WORKS ENTRANCE.

system. The main telpherage consists of a loop line running through the retort-house and over the coke yard hoppers; branch lines serving the generating station boilers, the residuals plant boilers, the water-gas plant, and the "Columbus" pan ash plant.

After seeing the auxiliary power station, which, equipped with a 150 KW. 220-B.H P. vertical generating set by Messrs. Allen, of Bedford, supplied from the adjacent battery of two 30 ft. by 8 ft. Lancashire boilers, is capable of taking-over the most important portion of the load, members had an opportunity of admiring the large building recently converted into the Distribution Department. This was described in the President's Address (see "JOURNAL," Vol. CLXI., p. 829), and comprises a central store, surrounded by offices, and meter and stove repairing and testing shops.

The route next passed a crane track and private siding; the crane, by Messrs. Smith, of Rodley, being equipped with a 35-B.H.P. motor, and deriving its power from a number of conveniently situated plug boxes. By way of a branch oxide is conveyed to two catch purifiers (by Messrs. Willey and Co., of Exeter) for coal gas and water gas. From the outlet of these purifiers, the gas is taken to the site upon which are being centralized the works boosters, meters, and governors. The six boosters already on their beds, are all by Messrs. Keith Blackman, and are of the following ratings: One pair 50-B.H.P., each capable of setting up a differential of 30 in. when handling 400,000 c.ft. per hour. These machines will be used on the Mutley district in place of the tandem machines already mentioned. One pair 50-B.H.P., each capable of 14 in. on 750,000 c.ft. per hour. These will be used to boost the supply to the town mains through a governor situated in the centre of the house. One pair 12-B.H.P., each capable of 12 in. on

The President Explains.

350,000 c.ft. per hour. These are relief boosters, and are connected between the outlet of the meters and the inlet of the holders, their function being to relieve pressure on the purifiers. An automatic governor on the inlets ensures against a vacuum being set up in the purifiers.

At this point there was an opportunity of inspecting a new type of weatherproof holder-stock indicator varying greatly in design from that previously described. The mechanism and electric contacts are compactly housed in a cast-iron shield; and the holder movement is transmitted by the line to a large pulley. The latter, and all moving parts, are mounted in ball bearings; the whole, with the exception of the shield casting, being made on the works.

A Widlake distance pressure indicator was also to be seen connected up to the recording ammeters; the working being clearly demonstrated by the fitting of bulb and relief cock, whereby the pressure on the bell could be varied while the contacts and re-recording meter were observed. The high-class workmanship of this, as of all other apparatus (such as switchboard fitting) made in their shops, was much remarked.

Thereafter, considerable interest centred upon the "Columbus" coke separator, with which Mr. Hoyte expresses complete satisfaction, obtaining a 2: 2: 1 recovery of coke, clinker, and breeze from the works' ash production. The separated material falls directly into skips which are pushed out from under the plant on bogie trucks, and are removed by telpher direct either to boilers for steam-raising or to hoppers for conveyance to tip.

The laboratory adjoins the meter and booster house, running along its whole length for some 120 ft. It is divided by glazed partitions and doors into distillation room, balance room, general laboratory, gas analysis and calorimeter room, in which will be fixed separate sampling holders for coal gas, carburetted water gas, mixed gas, and gas from the experimental plant. Gas comes to the latter from No. 22 setting, which is isolated and at present trying-out a special design of hydraulic main. The plant has a capacity of about 6000 c.ft. per hour, and permits the testing of coals on a thoroughly practical working basis. It is a complete small gas-works. Information as to the actual conditions in the foul main is conveyed to the plant by a long-distance vacuum and pressure indicator. The exhauster is regulated by an automatic compensator working in conjunction with a special design of electrical regulator.

Passing the new purifying plant, by Messrs. Willey, of Exeter, the old meter and governor house, and a Thomas meter for the measurement of carburetted water gas, the party reached the carburetted water-gas plant. On this site are housed four Davison and Partner generators, each capable of an output of 1½ million c.ft. per day. The engine-room contains three No. 8 Sturtevant blowing fans, each capable of delivering all the air required by the generators at the heaviest period of the season. Two of these fans are electrically-driven by 55 B.H.P. E.C.C. motors. These machines were at one time mounted on combination base-plates with steam engines, and served the works as dynamos in the earlier days of the electrification scheme. Subsequently, the engines were scrapped, and the dynamos were converted to motors. The control gear is of the automatic time-limited type which comes into operation and speeds the fan up when the operator manipulates his blast controls. These motors on full load run at about 500 r.p.m., and during the run idle round at about 80 r.p.m. The third fan is driven by a 40 H.P. Archer engine, and is used as a stand-by to the electrical equipment. Two Bryan Donkin steam-driven exhausters were installed for the purpose of giving a high-pressure supply to the Plymstock district, and are each capable of dealing with 20,000 c.ft. of gas per hour to a pressure of 12 lb. per sq. in. These are now rarely used, their place being taken by the two Ingersoll-Rand compressors installed in the engine-room annexe. The latter when running at 250 r.p.m. are each capable of handling 43,000 c.ft. of gas per hour to a pressure of 25 lbs. per sq. in. An electrically-driven turbo exhauster by Messrs. Bryan Donkin was running, having a capacity of 200,000 c.ft. per hour against 32 in. W.G. It is used for exhausting the carburetted water-gas from the relief holder into the purifiers.

The inspection over, light refreshments were served in the new booster house; and the party, re-embarking in the motor coaches, returned to the Royal Hotel, where luncheon was provided for a company of some 140 visitors invited by the Chairman and Directors of the Company.

THE LUNCHEON.

Mr. J. H. Ellis (the Chairman) presided, and to his right were the Mayor and Mayoress of Plymouth. The occasion was also honoured by the presence of the following Directors of the Company: Dr. J. H. S. May, J.P. (Deputy Chairman), Mr. F. F. W. Hawker, Mr. O. Wilcocks with Mrs. Wilcocks, Mr. and Mrs. R. W. Winnicott, Mr. and Mrs. R. B. Johns, Mr. and Mrs. G. M. Dickinson, and Mr. and Mrs. F. M. J. Gibbs. Mr. F. Howarth (Water Engineer) and Mr. E. G. O'Kell (Electrical Engineer) represented local Departments; and Mr. D. Irving and Mr. F. Templer Depree were well known among the guests.

The Loyal Toast having been honoured,

Mr. J. H. ELLIS (Chairman of the Company) rose to propose the toast of the Southern Association of Gas Engineers and Managers, and of the ladies who accompanied them and graced their luncheon board. He did so with the utmost pleasure, as it thus fell to him to welcome them to the land of the old sea dogs of Devon, and to express the unanimous thanks of the Board of the Plymouth Gas Company for giving them their society. He must be very brief, for they had to catch the tide at Totnes, for though so many of the attractive beauties of Devon were inside the room, there were some left outside. [Laughter.] As an institution, the Southern Association had had nearly half-a-century of useful work, the character of which amounted to a sustained and consistent effort to lighten the work of the housewife and do away with drudgery. He understood there were a few Scotsmen present [laughter], and they would all agree with the great Scotch poet that it was a great and ennobling work "to make a happy fireside home for wean and wife." The work they had done—and they would do more—was all to this end. He personally had saved at least £100 a year from having an all gas house. Gas was now of special use, when that finest service, domestic service, was failing With the toast he coupled the name of his friend Mr. Hoyte. They in the Company felt that a high compliment had been paid to Plymouth by the election of Mr. Percy Hoyte as President of the Association; and it was certain that good would accrue to the Southern Association by having such a scientific and industrious man at their head. During the war he had done excellent work, and now his mind was set in the same direction as the minds of all those present—how to bring the cheapest liquid fuel to the home. Undoubtedly, if domestic costs were lowered mankind at large would benefit.

Mr. P. S. HOYTE rose amid applause to reply on behalf of the Association. He expressed thanks for the way in which their health had been drunk, and assured them that gas engineers wanted all the health their friends could wish them. By such meetings as this they gained inspiration. He often thought of the relatively monotonous lives that must be led by their colleagues in other branches of engineering—steel, marine, and even electrical. They had not at their heels that curious body of semi-scientific gentlemen who appeared to know less about chemistry than they did about company-promoting, who were continually telling them that they knew nothing at all about their business, and urging them to adopt this, that or the other process which, while doubling or trebling the price of their main product, would at the same time give the public something that not only was not wanted, but which the public had not yet been persuaded to think they wanted—

an almost equally important matter. In medieval times, philosophers spent their lives in the perhaps laudable but futile endeavour to transmute dross into gold. They had had to wait until well into the twentieth century for an individual to come forward, inviting and apparently obtaining large sums of the public's money for a process the reverse of this—the conversion of gold into dross. He referred, of course, to the recent loudly-trumpeted proposal to destroy that most valuable industrial and domestic fuel, carbon monoxide—which probably saved the country, and most certainly saved the town of Plymouth from starvation during the coal strike of 1921. Gas engineers had not yet ceased smiling over the photo which had appeared in one of the cheaper illustrated papers displaying the inventor, or rather the re discoverer, of an academic laboratory reaction, entrenched behind a mass of chemical glassware, solemnly contemplating a test tube, which presumably contained the results of his efforts—that rare and refreshing gas carbonic acid, which he had succeeded in obtaining by some catalytic agent from carbon monoxide. The poorest and most ignorant of their consumers could show him a trick worth two of that. He personally was enthusiastic for carbon monoxide, and he reminded the company that for three weeks during the great coal strike they had sent out 100 p.ct. of carburetted water gas. The whole of their 40,000 consumers had worked on it, and there had never been fewer complaints. Regarding complaints, by the way, he always treated these very seriously. The toast of the ladies had been coupled with that of the Association, and was a toast that would be honoured as long as that of H.M. the King. He ventured the opinion that no industry had done more to lighten the work of the ladies than had the gas industry, which stood not only for labour-saving but for cleanliness inside and outside the home. When one saw the beautiful buildings which were at present going up in London, it was terrible to think that in six months' time, by the burning of smoky fuel there would be nothing to distinguish them from the old grime-laden one. He trusted they might all live to see the day of effective smoke legislation.

Mr. J. H. ELLIS then proposed "The Visitors," coupling with the toast his old friend the Mayor of Plymouth and his new friend Mr. W. M. Mason. No one had worked more conscientiously for Plymouth than the Mayor; and the Corporation recognized that the Plymouth Gas Company too were doing their part towards the public weal.

The MAYOR, thanking them on behalf of the visitors, stated that the City Corporation had always enjoyed the happiest relations with the gas undertaking, which never came and broke up a road directly it was nicely laid! They worked in co-operation. In spite of that elusive thing called the therm, Plymouth had always been very kindly treated by the Company. He felt a gas undertaking was a job best run by a company; and he hoped there would never be introduced a Bill for the undertaking to be handed over to the Municipality. It was a case of working in friendly co-operation. He hoped all the visitors would carry away very pleasant memories from Plymouth, and wished to take this, his earliest, opportunity to express sympathy with their Chairman [who had withdrawn after proposing the toast] regarding his recent trial and tribulation. He trusted they would long have his help.

Mr. W. M. MASON (Manager of the "B.C.G.A.") also responded, saying that he felt highly the honour of doing so. It was certainly an honour to visit Plymouth and to realize the old associations of the town—it was an inspiration to think of the men of old who hailed from Plymouth. Plymouth stood not only for beauty, but for duty—that of trying to make the world easier for people to live in. In lighter vein, he drew much laughter by asserting that on the Hoe he found ducks in far greater evidence than drakes; but seriously speaking, not only for the members of the Association but for the other visitors and for the ladies, they would certainly carry away the most pleasant memories.

Mr. J. M. CAMPBELL, of Margate (Immediate Past-President of the Association), then proposed a very hearty vote of thanks to the Chairman and Directors for their kindness and hospitality. The Association wished to unite themselves with the Mayor's words of sympathy as to the trials of Mr. Ellis and his daughter. He hoped she was little, if at all, the worse for her terrible experiences. They were grateful also to the officials and the staff of the Gas Company, who had worked hard and given of their best. The visit had certainly been beneficial and enlightening. He associated with his remarks the Deputy-Chairman of the Company.

Dr. J. H. S. MAY, J.P. (Deputy Chairman), welcomed them all to the West, offering them hearty thanks for coming such long distances to see them. He hoped they would come again soon, and meantime carry home the most happy recollections of the meeting.

DEVON HILLS AND VALLEYS AND THE RIVER DART.

The Deputy-Clerk of the Weather was still doing his best when the party once more made themselves comfortable in the motor coaches and left for a long drive through the beautiful country which has so rightly been named Red Devon. Even under a leaden sky the soil is a true red, and long years have made the cattle assimilate something of its colour. Arrived at Totnes, the party found one of the River Dart steamers waiting, and tea was served as soon as the descent begun. The scenery there is delightful, and we can even record that the sun made three determined efforts to break through, one of which was timed to enhance the beauties of Dartmouth and the variegated shipping, dominated by the magnificent buildings of the Royal Naval College. Half-way home it began to rain in earnest; but good cheer and the design of modern charabanc hoods assured an end to the visit as enjoyable as the rest of the excellent arrangements, upon which Mr. Bennett and others concerned are to be warmly congratulated.

THE MINING EXHIBITION.

Interesting Exhibits for Gas Engineers.

The Mining Exhibition which is at present being held at the Royal Agricultural Hall is of marked interest, and embraces an extensive field. Improvements in the winning and preparation of coal for the market considerably affect the gas industry; and it was therefore not surprising to find several exhibits important not only to the mining engineer but to the gas engineer as well.

In the past, and, unfortunately, in many cases at the present time, coke-screening plant has not invariably given complete satisfaction. One of the first exhibits to which our attention was called was that of a new type of vibrating screen by Messrs. Huntington, Heberlein & Co., Ltd. The main feature of this is its simplicity. The complete vibratory driving mechanism consists solely of an unbalanced pulley, which is rotated at about 2000 r.p.m. for large screens, and up to 3000 r.p.m. for small screens, on a stationary hollow shaft fixed rigidly to the screen box; there being no eccentrics, cams, rockers, or other moving parts. This unbalanced pulley is lubricated by oil circulated under centrifugal pressure (produced by the revolving of the pulley) by means of stationary scoops within the pulley itself. At 2000 r.p.m. the oil pressure is about 15 lbs., and at 3000 r.p.m. is 27 lbs. per sq. in.—which is greater than the pressure on the shaft produced by the revolving of the unbalanced pulley—thus ensuring an even distribution of the oil over the whole effective bearing surface, and producing a cool bearing. The only part of the pulley which requires occasional renewal is a plain bushing. Across the screen box are fastened two hollow shafts or pipes, to the ends of which are secured spiral springs. The latter fit into castings which are bolted to rigid supports. These springs provide an efficient and flexible means of support, and, at the same time, allow the screen box to be vibrated without transmitting the vibrations to the structure on which the screen is supported. The vibratory movement in the "Overstrom" screen is slightly elliptical, with the differential motion towards the feed end of the screen. The intensity of the vibration can be varied from $\frac{1}{32}$ in. to $\frac{3}{16}$ in. in amplitude by simply changing the counterweights in the unbalanced pulley. The direction in which the material moves on the screening surface depends upon the direction in which the pulley is rotated.

Within the screen box are inserted the different screens, so spaced and independent of each other that any screen may be changed with the minimum of time and expense. Bolts passing through the side and end walls of the screen-box and into the stretching angle liners, which are held in place by these angles, prevent the overturned edges of the screen cloth from straightening-out. This provides a simple means of stretching the screens to drumhead tension, hence assuring the maximum screening efficiency. There is no wrecking action on the screen wires, because the drumhead tension holds each wire in its place; the whole screen cloth moving with the box. All bolts and fastenings within the screen surface are eliminated. Each screen cloth vibrates in unison throughout its width and length, and all the surface is available for screening. We learn that a large London Gas Company have installed one of these screens capable of dealing with 30 tons of coke per hour; the feeding being erratic. Owing to the satisfactory working of the plant, the installation of another of greater capacity is contemplated. A special feature of interest is the small ground space occupied—often a factor of no small moment to the gas engineer.

A new gas-regulator is exhibited by the same firm. Known as the Reineke patent gas-regulator, it consists principally of two $\frac{1}{4}$-H.P. or $\frac{1}{2}$-H.P. electric motors, differential gear, float, and control gear. These parts are mounted on a common baseplate; and the whole is installed on the side of, above, or below the main on which regulation of the gas is desired. Connection is made with the throttle disc in the main by means of a horizontal or vertical rod, which is coupled to the projecting ends of the throttle-disc spindle and the secondary shaft of the differential gear. The worms of the differential gear are coupled to the two electric motors running continuously at equal speeds, but rotating in opposite directions, and drive combination wheels. The bevel teeth of these wheels are geared with two bevel-idler pinions that are loose on the bolt spindle, which passes through the shaft at right angles, and acts as a carrier of the movement. The worm is fast on the shaft, and is geared with another wheel which is keyed on the vertical shaft projecting through the casing of the differential gear. When the pressure in the main is normal, the float which works the electrical control-levers remains at rest, and both motors, as well as the combination wheels, run at the same speed. Therefore the idler pinions, which are loose on their spindle, remain in the same radial position, and no movement is transmitted to the throttle-disc in the main. On the other hand, should the pressure rise or fall below the desired normal, the float begins to move and, according to the fluctuation, agitates the contact gear controlling the motors; thus reducing the speed of one or the other. The apparatus working in direct gear with the motors, this change of speed also occurs in either of the combination wheels, and causes the pair of idler pinions to roll and alter their radial position in the requisite direction round the central axis of the shaft, which

transmits the movement, by worm-gear, to the valve in the main. This instantaneously regulates the supply of gas. The regulation is obtained solely by a change in speed, without reversing any part, and thus, always being in gear, the mechanism is entirely free from any sudden shocks due to jerky motion. Apart from the smooth running, which is an essential factor for the successful operation of a governor, these points add to the life of the apparatus. With the whole of the mechanism running continuously, the regulator is ready to cope with any variation in pressure, and instantaneously counters such fluctuations as may occur.

Of great interest was the model of a tar-distillation plant manufactured by the Chemical Engineering and Wilton's Patent Furnace Company. The plant, which is extensively installed in gas-works all over the country, is of the continuous cascade type designed for the production of dehydrated tar and intermittent complete distillation of pitch. A similar plant was described in a paper by Mr. P. D. Walmsley before the Eastern Counties Gas Managers' Association [see "Journal" for May 2, p. 285]. Messrs. W. H. Dorman and Co., Ltd., show various forms of wave-power plants, among which a special feature is made of the rock drill in conjunction with a portable wave-transmission plant. The flexible steel pipe line, known as "Flexstel," has considerable mechanical possibilities. The exhibit of the Victaulic Company, Ltd., comprises pipes and joints under pressure to illustrate the various advantages of the Victaulic joint. The speed with which pipes can be laid with this joint is remarkable; the pressure in the pipe tending to effect a seal. About two minutes suffices to fit a joint; and any misalignment of the pipes is accommodated. The British Petroleum Company, Ltd., show samples of various gas oils.

The special feature of an exhibit by Messrs. Ronald Trist & Co., Ltd., is the "Raybeam"—a new device for illuminating the meniscus of the liquid in any gauge. This consists of a simple contrivance in a brass casing which can be clamped to any existing boiler gauge. The light from a small electric lamp is concentrated through an optical glass transmitter; the rays being reflected through the water column. On their emergence from the liquid surface, refraction takes place; and this produces an illuminated ring, so that the gauge glass may be read from a distance, in the darkest boiler-house. Other apparatus shown includes the "Thermofeed" feed-water regulator, for controlling the height of water level in boilers; a pump governor automatically starting and stopping the feed-water pumps in conjunction with the feed-water regulators, thus avoiding wasteful and unnecessary running.

A working model of the fusion low-temperature process is shown by the Fusion Corporation, Ltd., of Cheshire. This process marks a new departure from the usual type of low-temperature plant in so far as scaling on the walls of the retort and the caking of the material are said to be prevented. It is also stated that the gland trouble has been overcome. The method devised in the plant for the removal of scale is chipping; and this chipping action is applied immediately on the formation of the scale. In the Fusion retort the main tube rotates; and in it there are a number of breakers or pulverizers, covering practically the whole length of the retort. These breakers are placed loosely, and there is no mechanism for driving them. In design the breakers are similar to elongated paddle-wheels, with the exception that the number of blades may be four or six or thereabouts. As the tube rotates, the breakers fall over from one blade to another; and having regard to the diameter of the breakers and the few blades, the actual blow given is considerable. This description would lead one to believe that the retort was noisy in action, and that the breakers would in a short time knock the retort to pieces; but we are informed that this is not so in practice. The edge of the blade falls upon the bed of the material being treated, and consequently not only prevents the formation of scale, but minimizes the caking tendency of the material itself. The blades also act as diggers, so that in addition to the constant movement of the material, due to the rotation of the retort, there is additional motion through the action of the breakers carrying part round to the other side of the retort.

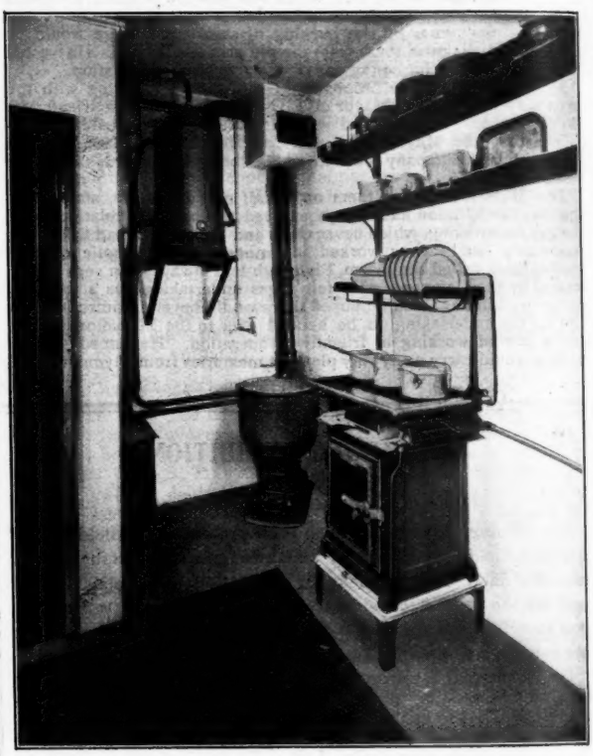
Messrs. Meldrums, Limited, exhibit a model front of an 8 ft. Lancashire boiler fitted with the well-known Meldrum forced-draught furnace, showing their smoke-consuming valvular dead-plate and special split bridge, which in itself is an effectual smoke preventer. A set of patent interlocking firebars, which cannot be displaced during clinkering operations, is also shown. The bars themselves are of narrow section, and the air spaces are also narrow, thus giving the greatest possible amount of "windage." The finest of colliery refuse fuels can be burned efficiently on this grate. Other exhibits include mechanical stokers, showing the only two moving parts of the sprinkler which come into contact with heat and grit; these parts being sturdy in design. The stoker is made in sprinkler and coking types, with or without forced draught. Mention may also be made of the Meldrum acid resisting metal; a centrifugal pump and steam-jet apparatus being shown.

Another design of interest is that of a coal-meter manufactured by the Lea Recorder Company, Ltd., of Manchester. This has been specially made for the measurement of coal as it is burned in connection with chain-grate stokers. The meter is shown fitted to a machine for measuring bulk supplies of coal. This machine is a combination of moving belt, and is so arranged that the coal passing through is measured irrespective of the rate of discharge. Another useful appliance is the "Standard" Lea recorder. This instrument indicates the rate of flow in gallons or pounds per hour at any moment, and, in addition, produces a chart record of the flow per day, or per week, from which the total quantity passed can be obtained.

Last, but by no means least in importance, the Lancashire and Cheshire Coal Research Association contribute a valuable exhibit, in pamphlets concerning the micro-structure of coal, spontaneous combustion, and safety in mines.

THE KING AT BECONTREE HEATH.

The King's visit to Becontree Heath yesterday for the purpose of opening St. Thomas' Church Hall and inspecting the new estate, focuses attention upon an undertaking in which gas for lighting, cooking, and water heating has been given full recognition. The London County Council housing scheme at Becontree is of an extensive nature; and though it is still far from complete, there are already approximately 4000 houses finished and in occupation. The whole of the estate comes within the area of supply of the Gas Light and Coke Company; and the gas service and equipment are of that high order always associated with this undertaking. The houses, which are of various sizes and designs suitable for the artisan type of resident, are in many cases equipped with Richmond's well-known "Bungalow" cookers.



A Scullery on the Becontree Estate.

The arrangements made for providing hot water at scullery sink, bath, &c., are of special interest. Many hundreds of Richmond's patent "Hollar" circulating boilers have been fitted; and these are giving excellent results. The special considerations which make them so suitable for dwellings of this nature are:

1. Its exceptional durability and freedom from intricate or sensitive parts.
2. The fact that it is ready for use within ten minutes of lighting, when moderate quantities of scalding water may be drawn-off every few minutes for any length of time, with sufficient for one or more baths at short notice.
3. When hot water for ordinary domestic purposes only is required, this is obtained without having to heat sufficient for a bath—without recourse to a "cut-out" valve.

The illustration shows a scullery in one of the houses on the Becontree estate equipped with a Richmond "Bungalow" cooker and "Hollar" boiler. It will be seen that the latter is mounted on a wall bracket which lifts the apparatus well above all floor draughts. This arrangement allows the draw-out burner to be easily reached without stooping. No separate storage cylinder is required, as the "Hollar" boiler is entirely self-contained and consists only of seven parts. The makers claim that this boiler heats water nearly as quickly as a geyser, and many times faster than a good kitchen range; and experience at Becontree Heath bears out this claim. In the houses referred to, the gas-heated circulator is connected to the coal-range boiler behind the living-room fire, so that when the latter is in use the "Hollar" can be employed to speed the hot-water service.

LOW-TEMPERATURE CARBONIZATION BY THE MEDIUM OF WATER GAS.

THE MARSHALL-EASTON PROCESS.

By F. D. MARSHALL.

With the advent of new standards for the supply of gas for domestic lighting and heating purposes based on the thermal instead of the illuminating value of the gas, new aspects have presented themselves in connection with the carbonization of coal.

In modern times the thermal efficiency of externally-heated gas-retorts has, by means of preheating the secondary air and perfected recuperative arrangements, been brought up to as high a point as it is practically possible for the fireclay retorts and surrounding brickwork to endure. But even so, the fuel consumed in the heating process ranges between 10 and 15 p.c. of the weight of the raw coal treated; while the maintenance of the retorts and settings is reaching uneconomical points, considering that the temperature in the settings now reaches as high a figure as 2200° Fahr.

According to the investigations carried out by the French savant, M. Euchène, and the American savant, Mr. Barnum, the thermal balance of a first-class regenerative setting of retorts is approximately as follows:

Expended in flues of setting = 45·9 p.ct.	Carried up the chimney as waste products	25·2 p.ct.
	Lost by radiation	19·9 ,,
	Lost in ash and clinker	0·8 ,,
Used in retorts = 54·1 p.ct.	In carbonizing the coal	21·4 p.ct.
	Escaping as sensible heat in the hot gas	13 8 ,,
	Escaping in the hot coke	18 0 ,,
		100 0 p.ct.

As 10 p.ct. of the weight of the coal is used as fuel, and 21·4 p.ct. of this is employed, the fuel required is actually only 2·14 p.ct.

One cannot regard these authentic figures without coming to the conclusion that the modern system of gas manufacture is neither rational nor economical. And why is this extravagant use of heat required? Primarily because the disposition of the coal in existing types of retorts is of such bulk and thickness that even a heat of some 2200° Fahr. cannot penetrate to the heart of the coal, and so effect complete carbonization, under from six to eight hours, or in the case of vertical retorts double this time. Secondly, the desire of gas-makers to extract from the coal a greater, and still greater, quantity of gas; and this can only be effected by the application of heat, and still more heat.

Coal is a non-conductor, as also is the fire-clay composing the retorts, so we have two elementary forces fighting each other to the point of destruction. And what is the result of this costly battle? A gas poor in quality, containing undesirable elements such as naphthalene (that bugbear of all gas-makers), an increased quantity of sulphur compounds, 10 to 15 p.ct. of inerts, and a number of incidental worries in the form of choked ascension pipes and hydraulic mains, graphited retorts, and a terribly inflated bill for maintenance. The poor gas is due to the degradation of the methane, ethane, and propane constituents of the gas—constituents of high thermal value—in favour of an increased quantity of the far less useful hydrogen. Then—the paradox of it all—more hydrogen in the form of carburetted water gas is added (reinforced by the rich gases of an imported oil) to replace the degraded methane and its sisters. A more illogical cycle of operations it is difficult to conceive.

THE ADVENT OF THE THERM AND ITS INCIDENCE ON CARBONIZING METHODS.

The advent of the therm will assuredly exert a beneficial effect towards reducing the evils of the high-temperature methods, and will eliminate the inducements to squeeze the coals to exhaustion to extract the last cubic foot of gas, now that gas, as regards quantity, is no longer to be paid for by the consumer. Everything points to methods which will enable the consumer to receive as many therms in the least practicable quantity of gas to carry them. The therm-giving constituents of coal gas are based on retaining in the gas the methane, ethane, propane, and their homologues, which are now so ruthlessly degraded. These represent therm quality; while to carry them, and to increase quantity, recourse will be had to blue water gas. Everything points to the gradual disappearance of carburetted water gas—that is, as far the use of oil is concerned—and a reversion to the more logical and less costly use of low-temperature gas, rich in saturated and unsaturated olefines and paraffins, to reinforce the blue water gas. Such a mixed gas would be absolutely free from naphthalene; and inerts or incombustibles would probably not exceed 8 p.ct.

Regarding the thermal values of the saturated and unsaturated rich gases, it is of interest to quote the researches of Dr. Lessing on the point (see Meade's "Modern Gas-Works Practice"), which summarized are:

Saturated Hydrocarbon Gases.

Methane	992 B.Th.U. per c.ft.
Ethane	1730 ,, ,, ,,
Propane	2207 ,, ,, ,,

Unsaturated Hydrocarbon Gases.

Ethylene	1559 B.Th.U. per c.ft.
Propylene	2301 ,, ,, ,,
Butylene	3042 ,, ,, ,,
Acetylene	1452 ,, ,, ,,

These represent 27·85 p.ct. of high-temperature gas.

Other Gases.

Carbon monoxide	318 B.Th.U. per c.ft.
Hydrogen	320 ,, ,, ,,

Representing 50·42 p.ct. of high-temperature gas.

Inerts or Incombustibles.

Carbon dioxide	4·07 p.ct.
Oxygen	1·09 ,,
Nitrogen	15·46 ,,

Representing 20 62 p.ct. of high-temperature gas.

It is self-evident that it is of paramount importance to conserve the largest possible quantities of the above high thermal gases; and the only direction is by a reduction of temperature of carbonization, and by reversion to what is termed low-temperature methods.

Quite outside the writer's long experience in connection with low-temperature operations, it is well to quote independent authorities; and in respect to the quantities of the saturated and unsaturated hydrocarbons in low-temperature gas, the records of Messrs. Taylor and Porter, of the U.S. Bureau of Mines, are authentic. Employing a carbonizing temperature of 482° to 510° C., they obtained 6000 c.ft. of gas per ton, containing 7 p.ct. unsaturated and 25 p.ct. saturated hydrocarbons (principally ethane and its higher homologues), and a yield of tar oils of 12 p.ct. of the total coal.

It is thus seen that, while in high-temperature gas the high thermal hydrocarbons are present only to the extent of 27·85 p.ct., in low-temperature gas they exist to an extent of 32 p.ct. The quality of the 6000 c.ft. of gas would be about 800 B.Th.U. per c.ft.

COMPLETE GASIFICATION OF COAL.

The complete gasification of coal (by complete gasification is indicated the carbonization of the coal and the gasification of the resultant coke, the gasification of the latter providing the medium for the carbonization of the former) is greatly exercising the minds of gas-makers. The most noteworthy installations are of what are termed the single apparatus type constructed by the superimposing of a fireclay retort on a water-gas generator; the water gas passing upwards through the mass of the coal in the retort while the blow gas is ignited in the chequer work surrounding the retort.

The drawbacks to this system are:

(1) That the whole of the coke produced must be gasified, yielding a definite mixed gas considerable in quantity but poor in quality.

(2) The uncertainty of completely carbonizing the retort charge before it, as coke, reaches the water-gas generator.

(3) The rate of travel of the coal through the retort depends entirely on the rate at which the coke in the generator is consumed, and on the frequency and duration of the clinkering operations, as the base of the coal column rests on the apex of the coke column in the generator.

(4) The difficulty of ensuring that the heat generated by the combustion of the blow gas in the chequer work surrounding the retort will permeate the whole mass of the coal in the retort, considering that this is a very thick column (some 2 ft. in diameter), and that the heat has to pass through 3 in. of fireclay of the walls of the retort before penetrating even the peripheral skin of the coal.

(5) If the coal is insufficiently carbonized before reaching the water-gas generator, much of the valuable tar oils are destroyed, and uncarbonized coal is found in the ash pit.

(6) The difficulty in getting the coal to descend the retort without frequent poking.

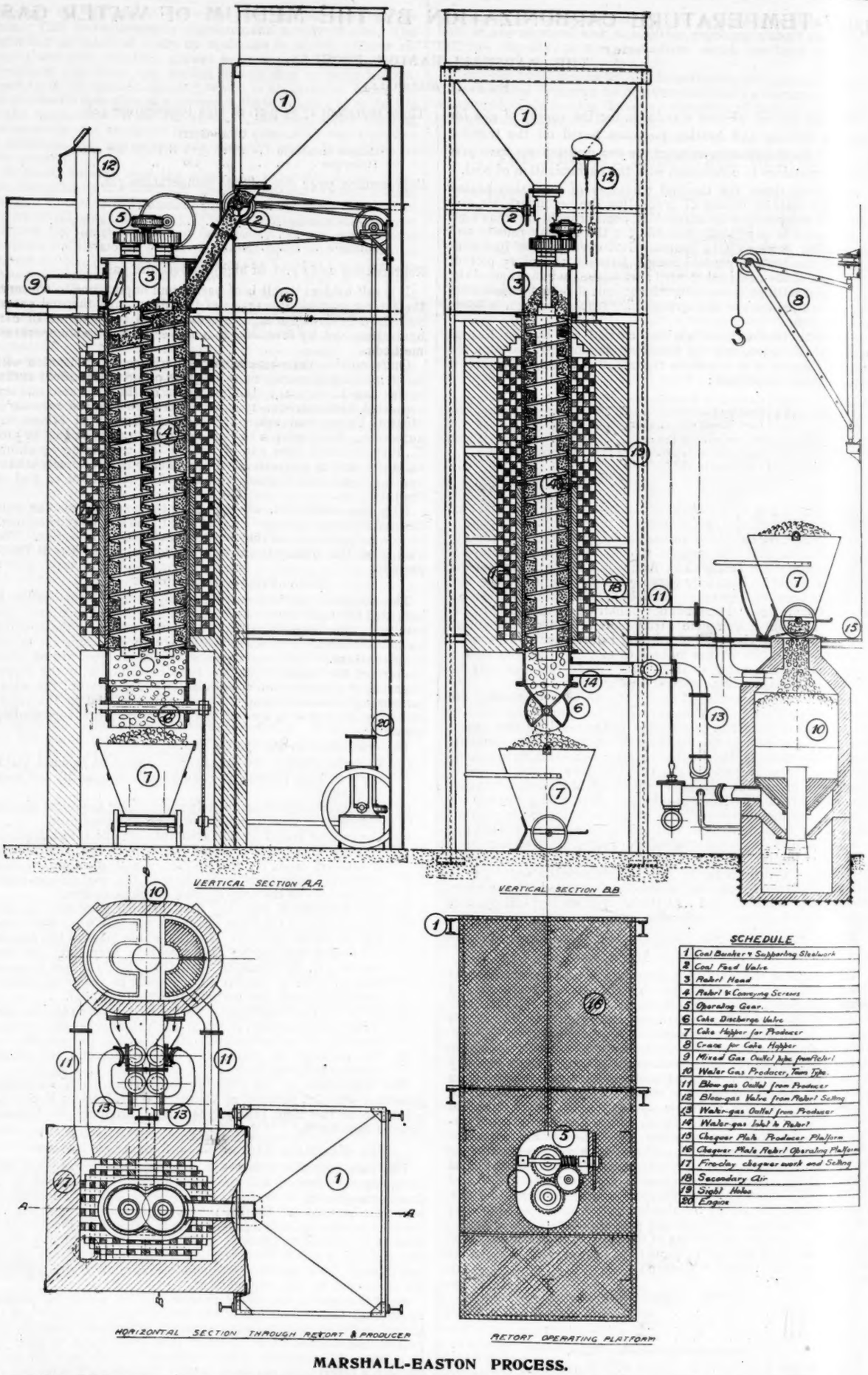
The originators of the superimposed retort on a water-gas generator were Dr. Strache, of Vienna, and Mr. Herbert E. Smith, who was at the time (many years ago) Engineer to Messrs. Kramer and Aarts.

THE MARSHALL-EASTON TWIN PROPELLER RETORT.

The twin-propeller retort has been designed to obviate the foregoing drawbacks; and the operations are carried out by a dual arrangement of an independent retort and an independent water-gas generator. By this means complete carbonization of the coal is ensured, and the generator is fed with as much of the coke as is required to produce a gas of any desired quality from 260 B.Th.U. per c.ft. of mixed gases through any range up to 550 B.Th.U. The whole of the valuable tar oils containing petrol are conserved by this arrangement.

As in the case of the single process, the hot water gas passes up through the coal charge in the retort; while the blow gas is ignited in the surrounding chequer work. It has been conclusively proved that it takes a low temperature of 1200° Fahr. at least 3½ to 4 hours to penetrate 4½ in. thickness of coal; and this only through a retort with cast-iron walls. Through a fireclay retort this time would be prolonged to 10 to 12 hours.

The writer has had over eight years' experience with cast-iron re-


VERTICAL SECTION A.A.
VERTICAL SECTION B.B.
HORIZONTAL SECTION THROUGH RETORT & PRODUCER
RETORT OPERATING PLATFORM
SCHEDULE
1 Coal Bunker & Supporting Steelwork
2 Coal Feed Valve
3 Retort Head
4 Retort & Conveying Screws
5 Operating Gear.
6 Coke Discharge Valve
7 Coke Hopper for Producer
8 Crane for Coke Hopper
9 Mixed Gas Outlet pipe from Retort
10 Water Gas Producer, Twin Type.
11 Blow-gas Outlet from Producer
12 Blow-gas Valve from Retort Setting
13 Water-gas Outlet from Producer
14 Water-gas Inlet to Retort
15 Chequer Plate Producer Platform
16 Chequer Plate Retort Operating Platform
17 Fire-clay chequer work and Setting
18 Secondary Air
19 Sight Holes
20 Engine

MARSHALL-EASTON PROCESS.

CONTINUOUS COMPLETE GASIFICATION TWIN-SCREW RETORT PLANT BY MEANS OF WATER GAS (THE TAR OILS ARE CONSERVED).

torts in which the coal is disposed in annular rings 4½ in. thick, with the results quoted. These retorts were charged and discharged intermittently; between which times the charge remained in a static condition. The design of the twin-propeller retort has taken advantage of the necessity for using annular rings of coal of some 4½ in. thickness, but has gone further, and caused these rings to travel down the retort at any desired speed; thus making the retort automatic, both as regards charging and discharging.

This has been accomplished by constructing the interior of the retort with twin propellers or screws. These propellers are unique in design, and are the subject of valid patents obtained in many countries. The blades of the propellers segmentally overlap and wipe each other, so that highly bituminous or sticky coal cannot hold itself up in the retort, as it is being continually wiped forward and downwards. The coal charge automatically arranges itself in two segmental rings between the blades of the propellers, some 6 in. deep by 4½ in. thick. These rings of coal are cut by a chord of the circumference of the propeller blades where the latter overlap and wipe each other. The shell of the retort (silicon cast iron) is in the shape of a time glass; each propeller having its own recess. By this means the coal is distributed along the circumference of two circles excepting at the chord where they cut each other. Thus in a retort with an approximately 10 ton throughput per diem there would be some

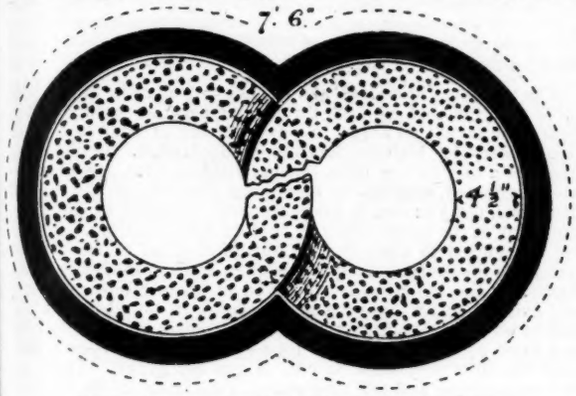


Diagram showing in Plan the Segmental Coal Rings.

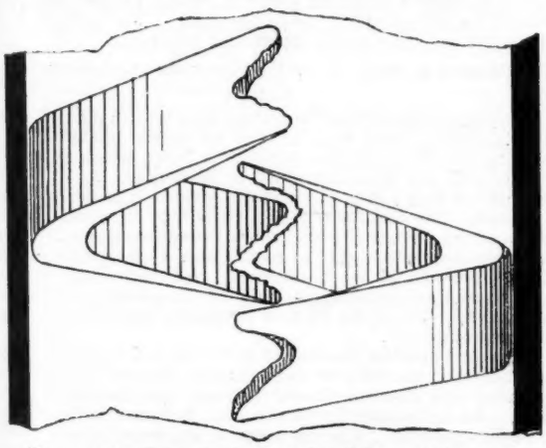


Diagram visualizing the Segmental Coal Rings in Elevation.

twenty-eight segmental rings of coal with a combined circumference of 7½ ft. by 6 to 7 in. deep by 4½ in. thick. The external heat has to pass only through 1½ in. of cast iron and the 4½ in. of coal, which it can easily do in under three hours.

The writer's experience with silicon cast-iron retorts for over eight years with the same retorts has shown that, after this long time, they are practically as good as new, although these retorts for experimental purposes have been heated to 1400° Fahr. The screws, themselves of silicon cast iron (hollow castings), are protected by the shield of the coal rings, and are never heated to more than 800° Fahr. The speed of the screws is approximately six to ten revolutions per hour; and they are operated by a powerful differential gear requiring little power. The automatic feed and the automatic discharge are run off the same shaft; and all are synchronized to work in unison. The time required for carbonization is under perfect control, as the screws can be speeded up, retarded, or stopped altogether, depending on the conditions of the coke as it leaves the discharger. If the coal be highly bituminous, the coke will leave the retort in compact masses as low-temperature coke. If the coal or shale be non-caking, the coke will leave in the same size and condition as it enters the retort. There is no churning-over of the coal—it just descends quietly in rings, as it does not make the circular rotation of the helices of the screws. The gas will make its exit partly round the retort, following the volutes, and partly up the centre in the spaces left where the volutes cut each other, and consequently cut the rings of coal across their chords. The setting is of the simplest description, and inexpensive.

Low-Temperature Carbonization by Recoverable Heat During the Process of Water-Gas Production.

The net efficiency of blue water-gas manufacture, taking into account the total quantity of fuel for the generation of the gas itself and the fuel used for raising steam for the blower turbine, &c., is not higher than 46·44 p.ct. This low efficiency is principally due to the losses of heat necessary to the formation of the water gas itself. Some of these losses are unavoidable and irrecoverable.

The 46·44 p.ct. efficiency does not take into account, other than the potential heat of the water gas, three other sources of heat which are only realizable during the actual process of water-gas making, and cannot be stored up. If these heats are realizable, the efficiency is increased to 73·9 p.ct. The three sources of heat are: (1) The sensible heat of the hot water gas, (2) the sensible heat of the hot blow gas, and (3) the potential heat of the hot blow gas.

To understand the proportion of these heats evolved during blue water-gas production, it is of interest to quote the published statements of the trials made at Birmingham, at the suggestion of the Institution of Gas Engineers, by Professors Smithells and Cobb, and Dr. Parker, aided by the distinguished research chemist, Mr. James Wood, and others. Furthermore, there are the independent investigations of Mr. Arthur Glasgow (Humphreys and Glasgow) and Mr. E. G. Stewart (Gas Light and Coke Company). These investigations, carried out with meticulous care, form the basis of the writer's calculations.

Table I.

Heat value of total fuel to generator and for raising steam = 100.

Heat supplied—	
Coke to generator	82·11 p.ct.
Fuel to raise steam to generator	8·51 ,,
,, ,, ,, ,, turbine	9·36 ,,
Sensible heat of air to blower	0·02 ,,
	100·00
Heat accounted-for—	
Water gas potential heat	46·44 ,,
,, ,, sensible ,,	1·81 ,,
Steam not decomposed (total heat)	2·21 ,,
Blow gas potential heat	20·94 ,,
,, ,, sensible ,,	4·74 ,,
Heat lost in raising steam to generator	2·55 ,,
,, ,, ,, ,, ,, turbine	2·81 ,,
Heat of steam used and lost in turbine and blower	6·50 ,,
Ashes—potential heat	3·84 ,,
Clinker	0·36 ,,
Dust	0·61 ,,
Ashes, clinker, and dust—sensible heat	0·33 ,,
Losses not separately determined, leakages, radiation, convection, &c.—difference	6·86 ,,
	100·00 ,,
Efficiency of gas production p.ct.—	
Fuel for generator and turbine included	46·4 ,,
Fuel for generator and turbine excluded	56·5 ,,

Table II.

Results per 1000 c.ft. of water gas made.

Coke (dry) in lbs. to generator	43·80
,, ,, ,, ,, raise steam (70 p.ct. efficiency)	9·54
Total coke (dry) to generator and for steam-raising	53·34
Carbon in lbs. to generator	36·31
,, ,, ,, raise steam	7·91
Total carbon in lbs. to generator and for steam-raising	44·22
Steam in lbs. to generator	35·20
,, ,, ,, turbine	38·67
Total steam in lbs. to generator and turbine	73·87
Air supplied in c.ft. at 60° Fahr. and 30 in.	2214·0
Blow gas produced in c.ft. at 60° at Fahr. and 30 in.	2465·0
Thermal value of water gas in therms (gross) = 306 B.Th.U.	3·060
Thermal value of coke to generator in therms gross	5·410
,, ,, ,, ,, raise steam ,, ,,	1·178
Thermal value of total coke	6·588
Efficiency of gas production p.ct.—	
All steam taken into account	46·4
Fuel for steam for generator and turbine not taken into account	56·5

Table III.

Heat balances in therms per 1000 c.ft. of water gas made.

One therm = 100,000 B.Th.U.

Heat to raise steam = amount from 60° Fahr. (with 70 p.ct. efficiency) = $1116 \times \frac{100}{70}$ B.Th.U. per lb.

Heat Supplied.

Coke to generator	5·410
Fuel to raise steam to generator	0·561
,, ,, ,, turbine	0·617
Sensible heat of air to blower	0·001

Accounted for.

Water gas—potential heat	3·060 = 306 B.Th.U.
,, —sensible ,,	0·119 = 11·9 ,,
Steam not decomposed (total heat)	0·146
Blow gas—potential heat	1·380 = 138 ,,
,, —sensible ,,	0·312 = 31 ,,
Heat lost in raising steam to generator	0·168
,, ,, ,, turbine	0·428
Ashes—potential heat	0·253
Clinker	0·024
Dust	0·040
Ashes, clinker, dust—sensible heat	0·022
Losses not separately determined, leakages, radiation, convection—difference	0·052

NOTE.—**These results, from a practical water-gas maker's point of view, working on a large scale, may be considered on the low side; and they would certainly have been higher had a different type of generator been employed, such as the twin type introduced by Kramer and Aarts and Dellwik-Fleischer.**

It is thus seen that with the coke taken as 100 p.ct., the heats of the three gases are:

Sensible heat of the water gas = 1·81 p.ct. of the total heat
,, ,, ,, blow ,, = 4·74 ,, ,, ,, ,,
Potential ,, ,, ,, ,, = 20·94 ,, ,, ,, ,,

As it is not assumed that these three sources of heat would be realizable at their nominal value owing to losses by radiation, and heat lost by combustion, it is proposed to reduce them to a calculated effective efficiency.

An average typical bituminous coal of the following composition

Moisture	2 8 p.ct.
Volatile matter	31·1 ,,
Fixed carbon	53·7 ,,
Ash	12·4 ,,
	100 0

would have a heating value of 11,400 B.Th.U. per lb., or 25,536,000 B.Th.U. per ton.

HEAT AVAILABLE FROM WATER-GAS PRODUCTION FOR THE LOW-TEMPERATURE CARBONIZATION OF ONE TON OF COAL.

It is assumed that the coke yield will be 75 p.ct. of the weight of the coal, and that the B.Th.U. value of the coke will be approximately of the same value as the coal. This assumption is based on the fact that the coke produced will be low-temperature coke containing on an average 10 p.ct. of high thermal value volatile matter. Such a coke has proved to be an excellent fuel for water-gas operations, as it is raised to incandescence and a high temperature by a minimum of blow.

According to the researches of Euchene and Barnum, the heat actually required for high-temperature carbonization at some 2200° Fahr. is only 2·1 p.ct. of the total heat value of the coal. Therefore the adoption of 2·75 p.ct. at a 50 p.ct. efficiency is reasonable, especially as the resistance to the heat consists only of a cast-iron wall (a good conductor) 1¼ in. thick, and a body of coal only some 4 to 4½ in. in thickness.

The total heat of the coke from 1 ton of coal = 75 p.ct. = 19,125,000 B.Th.U. It is taken for these calculations at 100 p.ct.

Heat supplied to generator—		
Coke—82·11 p.ct. of 19,125,000	15,625,000	B.Th.U.
,, 8·51 ,, ,, steam to generator	1,629,000	,,
Heat to turbine blower—		
Coke—9·30 p.ct. of 19,125,000	1,792,627	,,
Accounted for—		
46·44 p.ct. potential heat of water gas	8,894,000	B.Th.U.
27·49 p.ct. being the combined value of the Sensible heat of the water gas 1.81 p.ct. ,, ,, ,, blow gas 4·74 p.ct. Potential ,, ,, ,, 20·94 p.ct. = 27·49 p.ct. of the total B.Th.U. value	5,264,884	,,
	14,159,072	,,
Required for carbonization—		
2·75 p.ct. of 25,536,000 B.Th.U. (heat of original coal) at an efficiency of 50 p.ct. = 5·5 p.ct. of 25,536,000	1,404,480	,,
Heat available (by difference)	12,754,592	,,

If the 5·5 p.ct. of heat for low-temperature carbonization is taken from the combustion of the blow gas, *plus* the sensible heat of the water gas which totals 27·49 p.ct., $27{\cdot}49 - \left(5{\cdot}5 \times \frac{4}{3}\right) = 27{\cdot}49 - 7{\cdot}33 = 20{\cdot}16$ to reduce the coal to coke values. The balance of 20·16 p.ct. is more than sufficient for all the demands for steam-raising, both for generator and turbine blower which require—

8·51 p.ct. generator
9·36 p.ct. turbine
17·87 p.ct. ,,
leaving a balance of 2·29
20·16 p.ct.

LOW-TEMPERATURE CARBONIZATION BY THE SENSIBLE HEAT OF THE WATER GAS AND BLOW GAS *plus* THE POTENTIAL HEAT OF THE BLOW GAS.

The writer has conclusively proved, by eight years of experience of the low-temperature carbonization, in a bench of six cast-iron annular retorts, of some hundreds of tons of coal from practically all parts of the world, that the average yield of gas is approximately 5000 c.ft. per ton of approximately 800 B.Th.U. = 4,000,000 B.Th.U. per ton. The temperature employed ranged to 500° C. (932° Fahr.), though in some cases about 1000° Fahr. was used in the interior of the retort. The colour of the retorts was an incipient dark red.

PRODUCTION OF MIXED GAS.

If the coke available be taken at 75 p.ct. per ton of coal = 15 cwt., less 17·87 p.ct. to raise all the necessary steam, this leaves an available balance of 12·32 cwt. = 1379 lbs. for gasification.

1 lb. of coke yields 22 c.ft. of water gas.

All the available coke will yield 30,356 c.ft. of water gas of 306 B.Th.U.
5,000 ,, of coal ,, 800 ,,
= 35,356 ,, of mixed ,, 376 ,,

Half the available coke will yield 15,178 c.ft. of water gas of 306 B.Th.U.
5,000 ,, of coal ,, 800 ,,
= 20,178 ,, of mixed ,, 428 ,,

Quarter of the available coke will yield 7,589 c.ft. of water gas of 306 B.Th.U.
5,000 ,, of coal ,, 800 ,,
= 12,589 ,, of mixed ,, 502 ,,

All at per ton of coal carbonized.

The quarter of the 12·32 cwt. of coke = 3·08 cwt., will provide more than the heat required for low-temperature carbonization, bearing in mind that only 2 to 3 cwt. per ton of coal carbonized is necessary for high-temperature carbonization. In the latter case the 2 to 3 cwt. of coke, beyond yielding heat, are irretrievably dissipated, whereas by employing the coke in the method described, the 3·02 cwt. is again rendered available as water gas, providing at the same time the heat of carbonization. It must not be omitted to state that in the production of carburetted water gas the sensible heat of the water gas and the heat of combustion of the blow gas is employed in heating oil-carbonizing and fixing chambers, but the heat appears to be wastefully employed when one considers that it is devoted only to gasifying and fixing 2½ gallons of oil per 1000 c.ft. of water gas—or a yield from the oil of only some 80 c.ft. of gas per gallon. There are no bye-products, and one may except a nuisance in the form of an unusable tar. On the other hand, the same heat can be usefully employed in producing 5000 c.ft. of rich gas per ton of coal, besides the coke and oils as bye-products. The advent of the therm has assuredly killed carburetted water gas.

BYE-PRODUCTS FROM LOW-TEMPERATURE CARBONIZATION—COKE.

Low-temperature coke will contain from 7 to 12 p.ct. of smokeless flammable gases, and so will be easily ignitable. The question of the production of such a coke, which is not too friable, and will bear transport, is surrounded by difficulties, because the range of coal which will yield a transportable coke is limited. The coal must be of a fairly high bitumastic quality, with a strong tendency to agglomeration and expansion. It must be carbonized at from 950° to 1000° Fahr. in thin rings or slabs of not more than 4½ in. in thickness; and these rings or slabs must be confined between the walls of the retort so that advantage may be taken of the point of maximum expansion to secure hardness of texture.

The retort must be discharged at the time of the maximum expansion, as if the time of carbonization beyond this point be continued and the coke allowed to shrink, then the volatile matter in the coke is dissipated, and the coke becomes ordinary non-flammable gas coke. The expansion of the coke causes technical difficulties if the retort be a static one—that is, intermittently charged and discharged, as there is a great tendency with many types of coal for the coke to stick in the retort. Even if the retort chambers are well tapered, the difficulty, more or less, is always there. A great deal of skill and ingenuity has been expended in grappling with this problem.

There are only two forces which contribute to the formation of a hard transportable coke, and these are:

(*a*) High temperature.
(*b*) High temperature *plus* high compression.

The first represents a gas-works coke, as produced in horizontal or inclined retorts. The second represents a coke-oven coke. There is an intermediate hard coke produced in the well-known vertical retorts by moderate pressure and high heats. Given a suitable coking coal, coking can only be accomplished by low temperature under high compression. If the coal be coked at low temperature in a loose condition, with no check on expansion, the result will be a porous and friable coke.

THE IDEAL RETORT.

The ideal retort is one which will check the expansion but, simultaneously, keep the coal-coke moving, under which conditions the coke will leave the retort without trouble. It is believed that the "twin propeller" retort will afford a good compression and, at the same time, keep the coal-coke slowly travelling downwards. If a non-caking coal be employed either for high or low temperature operations, it will leave the retort in practically the same physical condition as that of entry. After years of trials

with really excellent low-temperature retorts, the writer has come to the conclusion that briquetting offers the best solution of the problem.

TAR OILS.

The crude oils obtained by the low-temperature carbonization of coal, cannel, lignite, or shales are hydrocarbons of the paraffin series, as distinct from the tar obtained from gas-works or coke-ovens, the first distillate of which is benzole, C_6H_6.

In describing low-temperature tar oils, Dr. Mollwo Perkin, who is a keen student of these oils, is probably right in describing them as a half-way house between the products of natural petroleum and shale oils.

It is of great interest to learn at what temperature they lose their characteristics of olefines or paraffinoids and pass over to the benzenoid series of aromatic hydrocarbons; and the writer is indebted to Dr. Dunstan, late of the East Ham Technical College, for having contributed to this solution. During a series of trials on the Tozer low-temperature annular cast-iron retorts, Dr. Dunstan established that the turning point was approximately 1400° Fahr.—or the highest point the retorts could comfortably stand.

The trials were conducted between 1200° and 1300° Fahr.; and in Dr. Dunstan's words: "The present series of experiments were undertaken to increase the yield of the aromatic series; and this could only be done by raising the temperature of distillation, without, however, militating against the excellent nature of the residual smokeless fuel or coke. The tar oils between 1200° and 1300° Fahr were heavier than at a lower temperature. The sp.gr. of the wet tar was 1·085 at 60° Fahr., and that of the dry tar 1·10. The light oils given off by fractionation at 170° C. gave 19 p.ct. of cresylic acid and 4·7 p.ct. of a combination of benzole and toluole." The presence of such a large quantity of tar acids in the form of cresylic acid is of great importance.

The question of the quantity of tar oils produced per ton of coal by low-temperature carbonization cannot be defined by any fixed formula, as the quantity varies in a somewhat perplexing manner, concerning which we have yet a good deal to learn; but the following statement is of value as a guide. These results were taken from a great number of trials, and may be considered as typical. There is no doubt that the spirits (A), when properly cleansed, make a first-class motor fuel.

Generally speaking, the qualities of the oils produced by fractionation may be classed as:

Motor spirits.—Fractions up to 170° C.

Middle oils.—Fractions from 170° C. to 230° C. These oils are excellent fuels and illuminants, and are of great value for internal-combustion engines, especially of the Diesel type.

Heavy oils.—These are good lubricants, and, combined with the middle oils, make good Diesel fuel. It is scarcely necessary to separate the two for the purpose.

Dr. Mollwo Perkin states: "The spirit obtained has a sp.gr. of about 0·800, and resembles very closely motor spirit obtained from petroleum. The middle oils have a sp.gr. of 0·900, with a flash point of 138° Fahr. The heavy oils have a sp.gr. of about 0·960, and flash points varying from 118° to 178° Fahr., which meets the Admiralty specification for fuel oils for war vessels."

COST OF OPERATING.

The costs of operating a straight coal-gas plant on the most approved continuous vertical retort high-temperature system, and a blue water-gas *cum* low-temperature carbonizing plant, are closely as follows.

To arrive at a standard of comparison, the actual figures for straight carbonizing and for water-gas production supplied to the writer by the technical authorities of a great gas company, are quoted. It is unnecessary to point out that the larger the installation the lower the costs, as up to a certain point the same number of men are required for a smaller installation as for a larger one, and the standing charges are practically the same. The figures are based on a throughput of 300 tons of coal per diem, producing, in the gas-works case, at 12,500 c.ft. of 500 B.Th.U. per ton = 3,750,000 c.ft., and a water-gas installation in two units of 1,000,000 c.ft. (each) output of water gas per diem. These large figures are taken as they represent the actual results of the two installations.

Note: Two units of water gas generation are taken so as to bring into comparison an output of some 3,500,000 c.ft. average per diem.

Installation of 84 continuous vertical retorts with a throughput of 300 tons of coal per diem = 3·5 tons per retort per diem = 12,500 c.ft. per ton = 3,750,000 c.ft.

		s.	d.		£	s.	d.
7	Firemen	at 11	6	per 8-hour shift	4	0	6
6	Assistant firemen	,, 10	9	,, ,, ,,	3	4	6
3	Leading topmen	,, 11	9	,, ,, ,,	1	15	3
9	Assistant topmen	,, 11	3	,, ,, ,,	5	1	3
9	Bottom men	,, 11	0	,, ,, ,,	4	19	0
6	Coke-quenching men	,, 10	0	,, ,, ,,	3	0	0
3	Elevator men	,, 10	0	,, ,, ,,	1	10	0
	Hydraulic main and flue cleaner, £3 11s. 10d. for 7 days				0	8	6
43	men				£23	19	0

Say, £24 = 5760d. ÷ 3,750,000 c.ft. = 1·53d. per 1000 c.ft. made.

These figures include the total retort-house work from the entry of the coal to the exit of the gas.

The cost of operating two 1,000,000 c.ft. per diem water-gas units, including the employment of the heat of the water gas to effect low-temperature carbonization in twenty-six 10-ton low-temperature retorts.

		s.			£	s.	d.
3	Water-gas operators	at 11	per shift of 8 hours		1	13	0
6	Coke men	,, 10	,, ,, ,,		3	0	0
6	Clinkering men	,, 10	,, ,, ,,		3	0	0
3	Boiler men	,, 10	,, ,, ,,		1	10	0
3	Elevator and retort men	,, 10	,, ,, ,,		1	10	0
21	men				£10	13	0

= 2556d.

The heat of the 2,000,000 c.ft. of water gas would produce from the coal by low-temperature carbonization 1,320,000 c.ft. of rich gas. Therefore the yield of mixed gas would be 3,320,000 c.ft.

2556d. ÷ 3,320,000 c.ft. = 0·77d. per 1000 c.ft. of mixed gas.

High-temperature operations per 1000 c.ft.	. . . . .	1·56d.
Mixed-gas operations ,, ,,	. . . . .	0·77d.
		0·79d.

0·79d. × 3,320,000 = £10 18s. 6d. = saving per diem in wages = £3987 12s. 6d. per annum.

Note—In this case twenty-six vertical-screw retorts would be employed (taking the smallest retort), against eighty-four in the high-temperature operations.

EXTRACT OF RESULTS OBTAINED BY LOW-TEMPERATURE CARBONIZING AT A TEMPERATURE UNDER 1200° FAHR.

Name of Coal.	ANALYSES. Coal. H_2O.	V.M.	F.C.	Ash.	N.	Smokeless Fuel. H_2O.	V.M.	F.C.	Ash.	N.	YIELDS PER TON OF COAL CARBONIZED. "A" Spirit.	Light Oils.	Heavy Oils.	Total Oils.	Tar Acids, Cresylic.	Pit Pitch.	Sulphate.	Smokeless Fuel.
											Galls.	Galls.	Galls.	Galls.	Galls.	Cwt.	Lbs.	Cwt.
Ballengleich (Natal)	3·34	25·10	53·65	19·0	..	3·7	9·85	63·11	23·34	..	3·25	3·9	4·0	15·2	1·8	0·34	36·5	16
Forest of Dean	3·1	31·2	58·57	7·0	..	dry	12·9	78·4	8·7	..	2·0	5·7	5·4	15·2	..	..	13	15·9
Hulton	dry	34·73	50·06	7·21	..	dry	8·26	82·85	8·89	..	0·83	4·9	7·9	18·4	..	..	20·7	14·7
Maltby Main	13·0	29·2	..	8·9	..	..	..	..	11	..	4·50	5·7	4·7	16·3	..	..	9·5	14·5
Silkstone, Beanshaw	..	30·9	..	..	..	..	8·0	81·6	10·4	..	5·06	6·0	6·1	17·2	..	..	..	..
Silkstone, winter slack	dry	32·85	58·31	8·84	..	dry	7·71	82·3	9·99	..	0·4	4·4	10·5	19·8	..	..	12·1	15·3
Silkstone, two-foot slack	dry	32·96	57·39	9·65	..	dry	8·08	75·52	16 4	..	0·5	5·0	11·0	22·0	..	..	10·91	15·75
Niddrie cannel	dry	50·87	44·4	4·73	..	..	..	..	..	..	5·0	12	19	..	..	2·37	17·4	10·0
Newbattle cannel	1·14	50·23	44·06	4·33	..	..	..	..	..	..	5·0	13·5	28·5	..	..	2·06	21·8	10 0
Hucknall belt pickings	3·8	21·2	43·7	31·0	..	..	..	..	34	..	2·2	7·52	2·27	14·2	..	0·39	11·0	14·4
Sulphide Corporation (Australia)	2·08	31·8	55·9	8·43	1·75	..	10·3	75·4	18·26	1·95	5·37	..	8	16·4	..	0·67	19·8	15·5
Bignall Hill washed pearls	..	..	..	5·4	..	..	..	..	7·4	..	2 5	5·7	4·0	22·0	..	0·8	23·8	14·0
Tilmanstone (slack) Kent coal	..	..	..	..	..	..	..	..	12·5	..	2 5	6·0	4·5	20·3	..	63·5 p.ct.	22	16
Snowdon (Kent coal)	..	..	..	..	..	..	..	..	13·8	..	3·0	8·0	3·9	17·3	..	62 0 p.ct.	19·2	16
Stanton Iron and Coal Company (cannel)	..	..	..	..	..	..	..	..	..	..	7·6	7·92	11 88	44·0	3·08	..	25·33	10
Wigan (cannel)	1·64	57·82	36·61	3·93	..	2·25	7·96	82·77	7·02	1·30	6·8	14·7	44 7	85·1	8·0	1·15	22·0	10
Lignite (Spanish)	5·24	35·74	..	9·99	1·30	..	12·50	15·60	..	1·24	2·2	4·4	6·95	22·71	..	..	18·5	11
Shale (Spanish)	..	..	..	..	..	..	..	..	..	..	1·1	1·2	17·00	30·1	..	..	19·1	worthless
Glapwell (slack)	..	..	..	..	..	..	..	..	..	..	3·54	5·03	5·40	17·96	13·0	..	18·6	16
Glapwell nuts	..	..	..	..	..	..	..	..	..	..	4·39	10·17	8 39	28·69	..	..	10·2	15·5
Tyne Boghead cannel (Mickley)	..	..	..	..	..	..	..	..	..	..	3·12	14·9	19·94	53·5	..	..	23·0	14·0

NOTE.—The cokes contain from 7 p.ct. to 12 p.ct. of volatile matter. The tar oils fractionate into tar acids (cresols), and represent (approximately) 7 p.ct. to 14 p.ct. of the crude oils. The oils contain 5 p.ct. to 8 p.ct. of paraffin wax.

COMPOSITION OF THE MIXED GAS.

It is first necessary to consider the composition of the low-temperature gas and the water gas.

(*a*) *Low temperature gas.* (Prof. V. Lewes.)

H	27·5 p.ct.
CH_4 and homologues	58·1 ,,
CO	7·3 ,,
CO_2	2·5 ,,
N	1·6 ,,

(*b*) *Standard blue water gas.*

H	52·0 p.ct.
CH_4	1·0 ,,
CO	38·0 ,,
CO_2	4·5 ,,
N	4·3 ,,

To provide a mixed gas at the rate of 12,589 c.ft. per ton of 502 B.Th.U., it is necessary to mix the above in the approximate proportion of 40 p.ct. of rich coal gas with 60 p.ct. of blue water gas; the resultant mixture consisting of:

(*c*)

H	42·2 p.ct.
CH_4	23·3 ,,
CO	25·7 ,,
CO_2	3·1 ,,
N	3·1 ,,

(*d*) As a matter of comparison, it is of interest to quote the composition of a good straight coal gas.

H	47·0 p.ct.
CH_4	27·5 ,,
CO	7·75 ,,
CO_2	3·5 ,,
Heavy hydrocarbons (C_nH_m)	3·5 ,,
N	10·5 ,,

= 520 B.Th.U. per c.ft.

(*e*) Of further interest, the composition of the gas made on the Strache-Smith type of single apparatus, constructed with a retort superimposed on a water-gas generator, is:

H	41·0 p.ct.
CH_4	12·2 ,,
CO	39·2 ,,
CO_2	2·2 ,,
N	3·7 ,,

Note.—These figures have recently appeared appended to an advertisement in the technical journals.

Referring to a previous and introductory part of this communication, it was pointed out that the writer had grave doubts as to the feasibility of effecting complete carbonization in a retort superimposed on a water-gas generator. With a properly-designed low-temperature retort it is possible to obtain 58·1 p.ct. of methane and its homologues, whereas by (*e*) only 12·2 p.ct. is obtained. This appears to bear out the writer's contention.

Inerts and Combustibles.

(*a*)	Inerts	4·1 p.ct.
	Combustibles	92·9 ,,
(*b*)	Inerts	8·8 ,,
	Combustibles	91·0 ,,
(*c*)	Inerts	6·1 ,,
	Combustibles	91·0 ,,
(*d*)	Inerts	14·0 ,,
	Combustibles	82·25 ,,
(*e*)	Inerts	5·9 ,,
	Combustibles	92·4 ,,

From a study of the foregoing, it appears that the production of a straight coal gas (*d*) is not a rational system, as the combustibles are low and the inerts high. Process (*e*) suffers from an inordinate quantity of CO. Process (*c*), previously described, appears to offer great possibilities. (This gas will contain no naphthalene.)

COST OF PLANTS (APPROXIMATE).

The calculations are based on the production of 1,000,000 c.ft. per diem, by:

(*a*) A straight coal-gas plant on the vertical-retort system.
(*b*) A low-temperature plant in conjunction with a water-gas plant.
(*c*) A straight low-temperature plant without water gas.

(*a*) A straight coal-gas plant would require 28 retorts of a capacity of 3 tons per diem = 84 tons yielding 12,500 c.ft. per ton = 1,050,000 c.ft. The cost of an installation, complete from the entry of the coal to the exit of the gas, to carbonize 100 tons per diem = £35,000 (approx.)
For 84 tons . . . = £29,680
This would represent per retort £1,060
,, ,, ,, per ton per diem £352

(*b*) A low-temperature plant on the twin-propeller system:

Coal gas	400,000 c.ft.
Water gas	600,000 ,,
Total	1,000,000 ,,

To produce 400,000 c.ft. per diem, 8 retorts are required. 8 retorts of 10 tons = 80 tons yielding 5000 c.ft. = 400,000 c.ft.

8 low-temperature retorts (in settings of four each) would cost, complete with housing, piping, bunker, elevator, machinery	£5,000
One 600,000 c.ft. water-gas plant, complete with housing, boiler, turbine, blower, &c.	£7,000
	£12,000
Per ton per diem	£150

(*c*) A straight low-temperature plant to produce 1,000,000 c.ft. of 750 to 800 B.Th.U. gas would require 20 retorts.

20 retorts of a capacity of 10 tons = 200 tons yielding 5000 c.ft. per ton = 1,000,000 c.ft.

20 retorts, with housing and everything complete, would cost £12,000
or £150 per ton per diem.

There would, therefore, on a 1,000,000 c.ft. per diem plant, be a difference in favour of a low-temperature plant, either straight or in connection with a water-gas plant, of £17,680

To allow for any error in the estimation of the cost of the low-temperature plant, a difference of £12,000 to £15,000 can with safety be assured.

MAINTENANCE AND REPAIRS.

In order to form any comparison it is necessary to study some statistics regarding the upkeep of a standard type of vertical fire-clay retort settings; and the excellent communication on this subject by Mr. Buckley, of the Droylsden (Manchester) Gas-Works, presented recently to the Manchester District Institution of Gas Engineers, may with profit be referred to. Regarding the cost of maintenance, Mr. Buckley remarks "that although this question has been asked, those approached would not, or most likely could not, give the required information." At any rate, Mr. Buckley, from his own experience, gave the costs at 10·66d. per ton. During the discussion of the paper, Mr. Robinson, Engineer of the Harrogate Gas-Works, and Mr. W. B. M'Lusky, of Halifax, gave the cost at 10·03d. and 10·27d. per ton, so that one may accept these figures as reliable. Furthermore, the life of the settings was given as a little over 2000 days—or approximately five years.

Taking as a basis the 84 tons previously referred to as carbonized per diem in a standard vertical-retort setting, in 2000 days (= 5 years), 168,000 tons at 10d. per ton = £7000. This appears to be a very stiff figure for upkeep, but only bears out the writer's statement in the preamble of this communication that the present heats employed are inordinately destructive to both material and gas. The writer's experience with a setting of six cast-iron retorts for over eight years proves that to-day they are in good condition; and with reasonable care they can be depended on for ten years or more. The prime maintenance costs have been incurred on re-lining the producer and providing new furnace bars; 2d. to 3d. per ton would cover all maintenance costs in connection with them.

Comparing the upkeep of the high temperature (*a*) plant, with a throughput of 84 tons per diem, with a straight low-temperature plant (*c*) with a throughput of 200 tons per diem, while the upkeep of (*a*) during its life would be £7000, the upkeep of (*c*) would not be higher than £5000, taking the lives of both at 2000 days. Moreover, without doubt, (*c*) would last 4000 days. Comparing the upkeep of (*b*), a low-temperature plant *cum* a water-gas plant, the result is 3d. per ton on 80 tons of coal per diem = £1.

3d. per ton on 12 tons of coke (water gas) = 3s. per diem × 2000 days = £300.

SUMMARY.

In submitting this article to the readers of the "JOURNAL," the writer has endeavoured to write in a moderate strain and to avoid any "wild cat" claims for low-temperature carbonization. As a high-temperature engineer of life-long practice, and with some years of practical investigation of the principles governing low-temperature operations, he has endeavoured to point out the possibility of changing to the advantage of the industry. When in 1913 the writer had the privilege of delivering a lecture on low-temperature carbonization to the Manchester District Junior Gas Association, he made use of the expression "for the present I see through a glass darkly as to how far a low-temperature process will be of any assistance to our profession." The glass became clear with the advent of the therm.

In conclusion, the writer desires to state that he is not the inventor of the clever twin screw or propeller. This is the invention of his Assistant, Mr. R. W. Easton; and to him the credit is due. The writer has only been the means of adapting this invention to a vertical retort dictated by his long experience.

Welding a Holder Crown.—Speaking of the use of the oxy-acetylene torch in the gas industry, Mr. E. E. Lungren told the International Acetylene Association, at Chicago, that the Western United Gas and Electric Company are finding it one of their most essential tools in the gas manufacturing station, and are constantly learning how to make it do more of the construction and maintenance work in a time-saving and efficient manner. They have made rapid repairs to boilers, tanks, shafting, steelwork, and castings generally. One job, which consisted of repairing a gas-holder at one of the smaller stations, proved welding to be a good way out of a very bad position. The holder, of 30,000 c.ft. capacity, and 44 ft. in diameter, was in need of an entire new crown. To rebuild the crown with riveted plates was out of the question, since the gas service could not be discontinued for the period required. The plan of welding an entire new crown was then resorted to. Before shutting-down the holder, the steel plates were all prepared to match. After landing the holder, the plates were hoisted into position, welded together, and the whole welded to the outer edge of the existing crown just inside the circumferential rivets. The job was completed in about eighteen hours, and proved entirely successful.

A NEW HAM BOILER.

FROM the Newcastle-upon-Tyne and Gateshead Gas Company (through the courtesy of Mr. T. P. Ridley, Secretary and Commercial Manager), we have received a series of photographs illustrating a new type of gas apparatus which, it is suggested, is original, but which, when developed to its logical conclusion, ought to have very wide-reaching results.

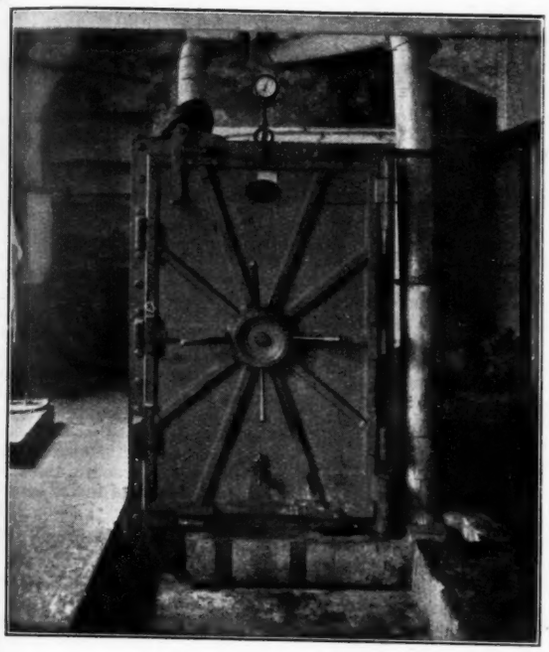


Fig. 1.—The Front of the Apparatus with the Door Closed.

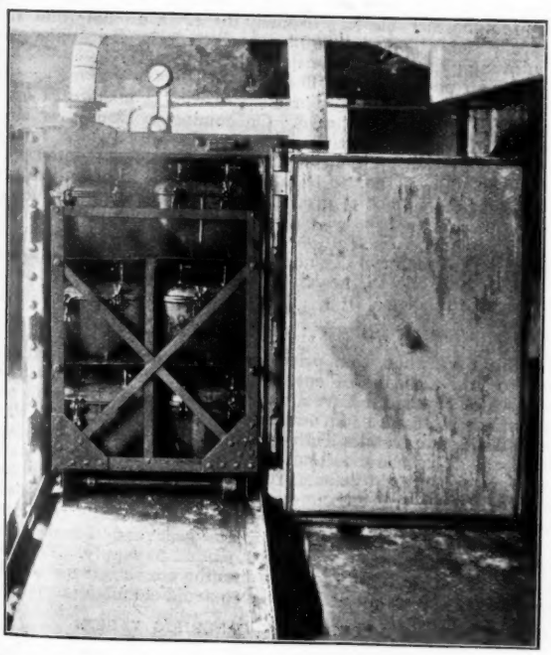


Fig. 2.—The Front of the Apparatus with the Door Open, the Truck and Hams in Position, and the Steam Issuing at the Completion of an Operation.

It is an entirely new form of ham boiler, made to hold thirty-six hams; each ham being in its own container. The thirty-six containers are placed on a steel bogey, which is then wheeled into the cooker. The bottom of this contains about six inches of water, through which pass tubes in which gas is burnt. The tubes are necessary because a considerable amount of dirt and rubbish collects on the bottom of the boiler, which would cause a fair amount of burning were the gas applied to it. When the gas is burnt in the tubes, no such trouble is, or can be, experienced. The cooker is sealed by means of the steam-tight door, clearly shown in the photograph. This is held in position by eight bolts; these latter being moved simultaneously by a camming action which operates on turning a handle. The handle, shown on the left-hand corner of fig. 1, operates a valve which ensures that the steam pressure is liberated before the door can be opened. The boiler is worked at 5 lbs. pressure, which is maintained constant by an automatic steam-controlled valve shown in fig. 4. The water is automatically maintained at a correct level

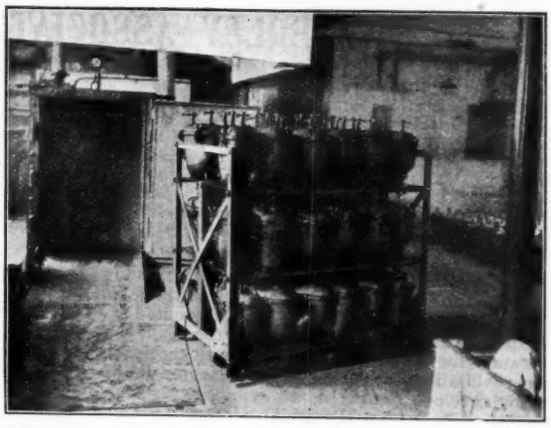


Fig. 3.—The Bogey Containing the Thirty-Six Hams ready to be put into the Boiler.

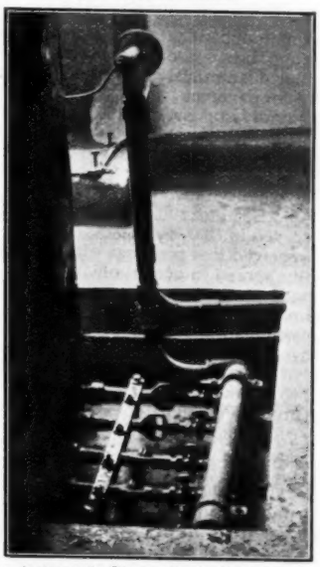


Fig. 4.—The Automatic Steam-Controlled Gas Valve and the Four Gas-Burners.

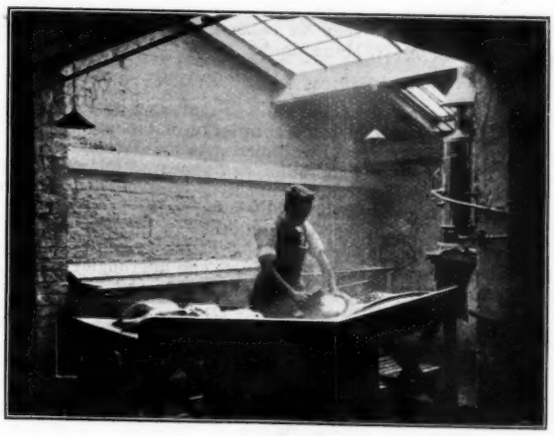


Fig. 5.—A Ewart's Geyser in Position Supplying Hot Water for Washing the Hams.

This apparatus is in daily operation; and, with gas at 9d. per therm, the net cost per ham boiled works out at ¾d.—an extremely economical result. The apparatus itself, which is patented, is the design of Mr. S. W. Bell, B.Sc., A.I.M.M., No. 4, The Quayside, Newcastle-on-Tyne. It was built by Messrs. W. J. Fraser, & Co., Ltd., Dagenham, Essex. The automatic steam-controlled gas valve was made by Messrs. Boyd & Co., No. 21, Low Friar Street, Newcastle-upon-Tyne, and the gasfitting work was

carried out by the Newcastle-upon-Tyne and Gateshead Gas Company. The firm for whom this apparatus was constructed are so pleased with the results that they have already ordered a second.

It may be interesting to know that the same type of steam-controlled gas valve is being applied to all classes of direct steam-heated and steam-jacketed gas-fired pans, with reliable and very economical results.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Edinburgh.

THE Annual General Meeting of the Waverley Association of Gas Managers was held last Thursday, in the Rooms of Messrs. Ferguson and Forrester, Ltd., Edinburgh. Mr. FRANK WELSH, of Duns, occupied the chair; and there was a representative attendance of members—about seventy being present.

STATEMENT OF ACCOUNTS.

There was submitted an abstract statement of income and expenditure for the year ended April 30, which showed that the revenue for the twelve months, including a credit balance of £27 carried forward from the previous year, amounted to £55 5s. 10½d. The expenses had not been heavy, with the result that, at the date of the audit, the Association had on deposit receipt in bank a sum of £30; while in the hands of the Treasurer there remained a credit balance of £10 9s. 4½d.

Mr. JOHN RICHMOND (Penicuik) moved the adoption of the report, and said it was most gratifying to find that the balance at the credit of the Association was so substantial.

ELECTION OF OFFICIALS.

The PRESIDENT announced that the Committee had given consideration to the appointment of a successor to himself in the chair; and they had unanimously agreed to recommend Mr. A. Macdonald, of Prestonpans.

The meeting generally approved of this nomination; and Mr. Macdonald indicated, while thanking the members, that he would endeavour to do what he could to uphold the best traditions of the Association.

Mr. A. DOW (Galashiels) moved the re-election of Mr. Philp, of North Berwick, as Secretary and Treasurer. They could not be more happily served in that direction.

Those present received this proposal with considerable heartiness; and Mr. Philp agreed to accept office.

It was announced that the Association had to elect two members of Committee for two years; and, in view of Mr. Macdonald's promotion to the presidency, one member for one year. The retiring members, Messrs. J. D. Keillor, of Harwich, and G. Urquhart, of Tranent, were both eligible for a period of service covering two years.

Mr. JOHN RICHMOND (Penicuik) considered they could not do better than re-elect Messrs. Keillor and Urquhart; and he moved accordingly.

Mr. J. D. KEILLOR, who had served continuously on the Committee for the past seven years, said he thought it was time that some fresh blood was introduced. Amid considerable laughter the speaker indicated that the time had now arrived when he ought to stand aside in favour of some younger man. He proposed the election, as a successor to himself, of Mr. W. L. Farquhar, of Peebles.

Eventually, it was unanimously decided to appoint Messrs. G. Urquhart, of Tranent, and W. L. Farquhar, of Peebles, for a period of two years, and Mr. Skead, of Jedburgh, for a period of one year, in the room of Mr. Macdonald.

HONORARIUM TO SECRETARY.

Mr. R. W. COWIE (Port Glasgow) said that, as a past secretary of the Association, he had some knowledge of the work entailed in the efficient discharge of the duties. As the Association now were in a sound financial condition, and appeared to be making substantial progress, he took the opportunity of moving that an honorarium of five guineas should be voted to the Secretary, Mr. Philp. This was only a small recompense to the Secretary for the work he did; but it would be some little recognition to him for the services he gave them so willingly and ungrudgingly.

Mr. HAMILTON (Loanhead) seconded, and the vote was carried unanimously.

Mr. PHILP, in acknowledging the kindness of the members, said this honorarium had come to him in the nature of a surprise. He had been happy to do what he could to further the interests of the Association without any reward whatever. The "Waverley" was flourishing; and he hoped it would continue in prosperity. So far as he personally was concerned, he would do what he could to keep it in the forefront.

NEW MEMBERS.

The following gentlemen were admitted to membership of the Association: Messrs. Allan Hannah, Gartmore, Larbert (Messrs. John Stein and Co., Ltd., Bonnybridge); Gregory Kepple, Edinburgh; A. T. Hounan (Messrs. Peebles and Co., Ltd., Edinburgh); J. H. Mackellar, Glasgow (Messrs. A. Hamilton and Co., Ltd.); David K. Milne, Dundee; John Mowatt (Messrs. A. Hamilton and Co., Ltd., Glasgow); J. D. Whitelaw, Glasgow; R. Baxter (Barrowfield Iron Works, Ltd., Glasgow); D. Morton, Kinross; J. R. Wyllie (Messrs. R. & G. Hislop, Paisley); G. Bruce, St. Andrews; and J. Fisher (Messrs. Barr and Gilmour, Glasgow).

Mr. F. WELSH, Duns, thereafter read the following

PRESIDENTIAL ADDRESS.

My first duty to-day is to return thanks for the honour you conferred upon me at your last annual meeting in electing me your President. It is no easy task for me to fill the place of the past presidents; and it is with considerable diffidence that I do so.

I think you will all agree that the gas industry has been in a better position this year than for a number of years, both as regards prices and supplies. The unsettled state of affairs in the Ruhr district, which has practically resulted in a cessation of German coal production, has led to a heavy demand for British fuel for shipment, principally to Germany, though both France and Belgium have also been heavy buyers. Unfortunately this has had the effect of making supplies difficult to procure, and also of causing a sharp advance in prices of all classes of fuel. I trust that an early settlement may be effected between France and Germany, and that our industry may be enabled to secure full supplies of fuel at prices more reasonable than those now prevailing.

PRICES FOR RESIDUALS.

Coke prices last summer, and, in fact, till late in the autumn, were disappointing. But for some months back much better prices have ruled; and I believe we may look forward to the higher values being maintained for some time to come. Tar and liquor prices also have been a little better than last year; but there is room for considerable improvement here. I do not think the smaller works, which are not in a position to have a sulphate or dehydrating plant, get the consideration they deserve.

With your permission, I will endeavour to give you my experience of selling a mixed gas in a works with a make of a little over 10 million c.ft. per annum. On coming to Duns over nine years ago, I was fortunate in taking over a works which, for its size, was very well equipped indeed, as only a few months previously the entire plant had been reconstructed. The only drawback I now find is lack of ground space for extensions. During these years I have been able to increase the output of gas by 80 p.ct., which has been no easy task in a place where there is practically no industry. The bulk of the increase is mainly due to heating and cooking, which department I have pushed with considerable success.

INSTALLATION OF TULLY PLANT.

During 1921, when coal prices were excessively high, we decided to find a means of cutting-down our fuel bill. Various plants which claimed to have a high yield of gas per ton being on the market, we gave each our careful consideration, and ultimately decided to instal a Tully gas plant of 50,000 c.ft. per day capacity as being the most suitable for our requirements. As I was aware there might be some resentment in bringing down the quality of the gas—my consumers for years having been supplied with a high-grade gas—I immediately decided gradually to reduce the quality, so that by the time the plant was ready I had given them a fair sample of the quality I intended to supply. The experience gained during these three months convinced me that I would have to be careful if I desired to avoid complaints.

GRADUAL DECREASE IN CALORIFIC VALUE.

The method I adopted may be of interest to you. Having two holders, I decided to use the smaller one, of a capacity of 10,000 c.ft., for Tully gas alone. From the plant, a 6-in. pipe is connected to a tar extractor, on the top of which is a 6 in. by 2 in. branch. The larger pipe goes direct to the holder, and the 2 in. is carried to the foul main, and is there controlled by a suitable valve. This valve I have lately fitted with an indicator showing the exact opening, so that one can observe exactly what amount is going through. Previously to this being done the valve was occasionally opened too far, and caused trouble. The 6-in. pipe to the holder acts as inlet and outlet.

The plant was ready for starting-up during the coal strike in 1921. Our fuel supply, like those of many other gas-works, was soon exhausted. I procured from England a wagon of furnace coke at a fabulous price; and here the trouble began. After a couple of days' working there was a solid mass of clinker inside the generator, which had to be chiselled out. That finished the

furnace coke for me, though I afterwards heard that others had used it from a different source without having much trouble.

GASIFICATION OF WOOD.

Being in the fortunate position of having a sawmill near at hand, I determined to try wood. Procuring a few cartloads of beech and elm, freshly cut, I found the results far beyond expectations. It was possible to make as much as 3500 c.ft. of gas per hour—a gas of fair quality; and I used this wood continually till the termination of the strike. The one detracting feature in its use was that every rhone and gutter in the vicinity was choked with particles from the wood during the "blow." Of course, had I intended to continue the process, this difficulty could easily have been overcome. By the beginning of the lighting season I had everything ready, and in good working order. From October to the end of December, 1921, I was regularly getting 13,000 c.ft. of gas per ton, equal to a dilution of 30 to 35 p.ct. Complaints regarding the quality were coming in rather faster than I cared for; and, having to look after them myself and keep on taking meter survey and collections, I was compelled to increase the quality by using coal of a much higher grade. This certainly improved matters considerably, and also enabled me to keep up the make per ton. On investigating the complaints, I found a few were due to defective services, others to unsuitable and dirty burners and faulty regulation. On tabulating the complaints, I found that three-fourths of them were of defective lighting—a branch of our profession which I am afraid is not getting the attention it deserves. A good light is the best advertisement our industry can have; and in places where there is competition from electricity it is up to us to make every effort to keep what we have, as once lost it is difficult to recover. I am convinced that free maintenance of all fittings would, to a very large extent, help this state of affairs, and would be welcomed by the bulk of consumers, even if a small charge per 1000 c.ft. had to be imposed for the purpose.

REGULATION OF QUALITY.

The greatest difficulty I had with a mixed gas was in keeping the quality regular. This at first gave me no end of trouble, but has been to a great extent overcome. I have three jet photometers working daily—one at the works, one in my house (which is in the vicinity of the works), and one in the town. All of these are checked each morning, also one hour before lighting time. This method was the means of cutting-down most of the complaints; and after two years' experience I think I have got over the majority of the difficulties, and am now practically free from trouble regarding the quality.

I find that since installing the plant our leakage has gone up considerably—nearly 5 p.ct. I am not quite certain how this has occurred, but am of opinion that it is partly due to the greater amount of condensation which takes place with a mixed gas.

SAVING OF COAL.

The saving in coal has been considerable—239 tons—but, of course, I have had a smaller supply of coke available for sale, as I start up the plant on coke each morning, and then use nothing but coal. There is also a diminished sale of tar and liquor; but at present prices this does not affect us much. Another matter which merits consideration is that, while previously I had two ovens of retorts working each winter, now one easily makes all the gas required. There is, therefore, a considerable saving in renewals, which latterly was a serious item for a small works.

Since the installation of the plant we have been able to do away with one-third of the laborious work of charging horizontal retorts; and I think that anything which lightens labour is to be commended.

OPINION OF THE TULLY PLANT.

Up to the present, the maintenance of the Tully plant has cost us nothing; and as far as I can see there will be no renewals for some considerable time. My own opinion of the Tully plant is that as an auxiliary to the ordinary gas-making plant it is of undoubted value. Its advantages are great—as it is ever ready at the shortest notice, easily manipulated, and practically foolproof. In the crisis experienced during the last coal strike a Tully plant permitted of a selection of fuels; coke, wood, and peat having been used successfully. It is possible to make all the gas with it. I understand that the makers have lately made considerable improvements; but I do not think I would like to recommend anyone to go the length of making all the gas with this plant.

In conclusion, there is a further point on which I would like to hear some discussion, and that is the charging for gas on the therm basis. In a small works this would certainly mean a considerable increase of work on the part of the manager. I am afraid it would take a long time before the consumers became reconciled to the change. There is also considerable expense to be met in the installation of a calorimeter. The local authority would also have to appoint a suitable person to test the gas periodically, to see that the quality was maintained.

Discussion.

Mr. JOHN RICHMOND (Penicuik), in opening the discussion, said that Mr. Welsh had paid a valuable tribute to his predecessor in Duns—that he had left the gas-works there in such a fine condition. The former gas manager at Duns was an old and esteemed member of the Waverley Association; and many of those present retained pleasant memories of him. Their President had mentioned one difficulty—that of securing suitable ground for extensions. When these were considered necessary, the average gas manager looked for ground, but never thought of carrying out his extensions in the air. He had known of instances where purifiers and scrubbers had been erected on the retort-houses. This was bound to effect a saving in feu duty. The President's paper gave a practical illustration of the resource which was constantly asserting itself in the gas industry. It was gratifying indeed to note that during the strenuous days of the war Mr. Welsh had made use of peat and wood fuel with considerable success. He believed that a good quality of gas was always the best to manufacture; but he agreed that this was a matter on which there was a variation of opinion. Finally, the President had touched on the question of payment by therm. On this topic he wished to remind them that in the past there had always been Parliamentary regulation and restriction as to the gas which should be supplied. To his mind, these were necessary. It should not be allowable for gas managers and engineers in different parts of the kingdom to make varying qualities of gas. It seemed to be essential that there should be a fixed standard. Hitherto the standard of candle power had proved quite satisfactory; and there did not appear to be any reason why a calorific standard should not be adopted. He considered it to be nothing short of an absurdity that charges should be made on the thermal basis. By adopting such a method of charging he felt certain they were going to complicate matters. The public did not understand that method of charging, and possibly never would. There did seem, however, to be no harm in adopting a calorific standard. If such a standard was agreed to, then it ought to be rigidly adhered to.

Mr. G. BRAIDWOOD (Coatbridge) regarded it as altogether useless for Mr. Richmond or any other gas engineer to proceed to argue that the principle of charging by therm ought not to be introduced. Therm charging was now the recognized law of the country. It was an Act of Parliament, and was compulsory after a certain date in some areas of Scotland. Such being the position, it was but adding to the difficulties of gas managers for Mr. Richmond to speak in such a fashion. In Coatbridge, Stirling, and Musselburgh, they already had experienced the thermal method of charging; and it seemed to him that from the point of view of the consumer and the manufacturer there was no finer or better system that could be applied than that of charging on the basis of B.Th.U. supplied. He had followed the presidential address very closely; and it seemed to him that it represented a strong argument in favour of the thermal basis. Indeed, if Mr. Welsh had been able to tell them the quality of the gas he had been manufacturing, and the number of therms per ton he was registering, it would have helped many of those present to a clearer understanding of his address. Proceeding, Mr. Braidwood said he supposed it would now be generally known that about a fortnight or three weeks ago the leading Scottish municipal undertakings had decided to make application to the Board of Trade for the introduction of the therm method of computation and charging as from May 15 of next year. Moreover, they must not lose sight of the fact that a decision along these lines had been unanimously agreed to. He was one of those who believed that in small works where horizontals were in use, the Tully or water-gas plant was a good thing. Where a vertical plant was in operation, however, he was not disposed to go the same length. Indeed, he had carried out a few experiments recently, and he found that water gas made in vertical retorts went into the holder infinitely cheaper than water gas manufactured in an outside plant.

Mr. J. D. KEILLOR (Hawick) said he was glad to know that Mr. Welsh's experience with the Tully water-gas plant had been so eminently satisfactory. In the matter of leakage, he was led to believe that the experience at Duns was not altogether a solitary one, because he happened to know of other cases where an increase of leakage had resulted after the installation of a Tully plant. Nevertheless, it seemed to him that the experience at Duns furnished a somewhat tempting problem. It ought to encourage Mr. Welsh and every other gas manager of scientific tendencies to investigate further. At the present time one heard a great deal about Tully plants and Tully gas. These reports were varied—good, bad, and indifferent; but since he had no practical experience of this plant, he felt he was not justified in saying much about it. To his mind, it was a system which called for a greater degree of intelligence perhaps than was usually found in the average stoker of a small gas-works. This was a circumstance which might account for much of the disparagement they heard at the present time in regard to Tully gas. On the lighting load of the industry, it did seem to him that the President had not gone far enough. As he viewed it, it was not those gas concerns that were facing competition from day to day that required boosting in the efforts to hold the lighting field for the gas industry. In such centres they would always find that gas was making both a brave and an excellent show. Rarely in such circumstances was it excelled by its powerful competitor. In his opinion, the low repute of gas lighting could be traced to those towns where there was no electrical competition at all. There the gas manufacturing concerns seemed content to jog along on the old out-of-date and stereotyped lines, quite regardless and heedless, apparently, of the possibilities of electrical competition ever reaching them. Because of such lack of enterprise, the gas industry had lost in the lighting field, and doubtless more would be lost in the future. He maintained that there was room both for gas and electricity. He believed they were all agreed on this point; but it was up to all of them connected with the industry to improve their methods and policy. Trouble ought to be taken to let the consumers of gas understand clearly that their custom was desired and appreciated, and that everything would be done to ensure that they got the best value for their money. He desired to associate himself with what Mr. Braidwood had said in regard to the system of charging by therm or on the calorific basis. Such companies as those at Duns and Hawick were not bound to adopt the Gas Regulation Act; but why exemption was made in their case he did not understand. He considered it would be a good thing for the gas industry at large if the non-statutory companies were roped-in and compelled to adopt the new Gas Regulation Act.

Mr. W. BROWN (Burntisland) remarked that he had been in charge of a water-gas plant at a town in Scotland for the past five years. The consumption in Burntisland had increased from 28 million c.ft. to 41 millions; and in view of this demand they would recognize that the

call to do something became insistent and imperative. Plans were actually prepared for a new works and railway siding; but the cost was altogether out of the question. It was decided, however, that they should cast their eyes around and see what could be done. In company with a brother manager and others in Burntisland interested in the question, he toured England. In the course of their itinerary they visited several works where different types of plant were in operation. As a result of these investigations, they decided to instal a Tully plant. Since this plant had been introduced into Burntisland, they had no reason whatever to regret the choice that had been made. Up to the present practically no repairs whatever had been necessary on the plant; and for the year just finished they had manufactured about 14,200 c ft. to the ton, and had something like 8 cwt. of coke to the ton. There were just one drawback—they could not use coal exclusively. It so happened that the works were situated in the very centre of the town, and, of course, complaints naturally arose if the emission of smoke was excessive. At the outset they had a few complaints; but these were wholly due to the fact that the services in Burntisland had been so very small. The difficulties in that direction had, however, been gradually overcome. Accordingly, he was bound to say, without fear of contradiction, that so far as Burntisland was concerned it had been a wise thing to introduce the Tully plant. It had unquestionably taken them out of the difficulty. At the last meeting, it was reported that the make was as high as 41 millions, and this, too, with two retorts less than they had when he first went to Burntisland.

Mr. J. M. Smith (Stirling) agreed with the remark that had been made that the smaller gas undertakings had not to face the same competition from electricity that the larger towns had. His idea was that in some of these smaller areas it could not be fairly argued that the consumers were getting the best value for their money. The trouble was that in many of the smaller places the work of regulating and adjusting burners had to be carried out by the manager himself. Very often this entailed a considerable amount of extra work. From personal experience, he had found it to be quite a good plan to regulate one burner. If a good light could be obtained, it was fairly safe to assume that there was little wrong with the rest. On the question of leakage, it was just possible that since Mr. Welsh installed the Tully plant his condensation was greater. It would be interesting and informative if the President could say whether there was any difference of temperature since the Tully plant was installed. The suggestion had been made that there was a lot of difficulty in charging by the therm. In Stirling they had experienced no trouble whatever. No doubt there had been difficulty in places where the consumers had not been properly and thoroughly advised of the change and instructed in the methods; but where that necessary detail was attended to, everything proceeded with perfect smoothness. Then it must not be forgotten that every assistance would be given by the National Gas Council in helping those who were desirous of applying the Gas Order to the undertaking for which they were responsible. Indeed, he understood that a model account form had just been sent out which showed quite clearly the details that had to be filled in for the annual returns. At Duns, a calorimeter would have been a good investment. It certainly would have ensured greater accuracy than the jet photometer. The great obstacle at the moment appeared to be that there was no calorimeter on the market which could be claimed as completely satisfactory.

Mr. A. Dow (Galashiels) said that the President in his address had rather suggested that he was not getting the consideration he deserved for his coke, tar, and liquor. The remedy was for Mr. Welsh to bring himself within the scope of the National Gas Council scheme. He would get the market value for his tar and liquor. He was not at all surprised to learn that the Tully plant, in a time of stress like the coal strike, had proved amenable to the use of wood as fuel. Wood was a good substitute to use in such an emergency. Even he himself, with Dempster-Toogood vertical retorts, had successfully carbonized sawdust during that period. At the same time, he would not care to continue that expedient, as he was afraid acetic acid would affect the steelwork. The point in regard to leakage had been very effectively touched upon by Mr. Smith, of Stirling. The whole thing might be due to the Tully plant not being at a high enough temperature.

Mr. Brown: It was only a matter of a month.

Mr. Dow replied that, nevertheless, he did not think that these complaints should be put down to the discontinuance of the Tully plant altogether. He strongly recommended small undertakings to possess themselves of a calorimeter, particularly if they were dealing with mixed gas.

Mr. Forbes Waddell (South Queensferry) said that he had not as yet heard anything that made him wish to charge by the therm. He should like very much to have some clearer and fuller information on the subject from Messrs. Braidwood, Keillor, and Smith. In his own case, he had himself practically everything to do in connection with the rendering and collection of accounts. Was it not the case that they required to convert 1000 c.ft. into therms by the aid of a calorimeter? This naturally involved an outlay of money. Then, were those who advocated the therm method of charging prepared to carry on with the same office staff as hitherto? Why should not the members of the Waverley Association, who were principally in control of the smaller works, continue making their straight coal gas with verticals? He was doing this, and he found it to be eminently satisfactory. He was disposed to acknowledge that Mr. Richmond was right. His own experience had gone to show that he had a far better chance of fighting the electric light by giving a decent, rather than an inferior, quality of gas—something in the region of 18 or 20 c.p.

Mr. A. T. Hounan (Edinburgh) said his firm (Messrs. Peebles and Co., Ltd.) had been experimenting for two years with a meter which registered directly in therms. It gave readings accurately and maintained the standard throughout. The general feeling was that it was as near perfection as could be got. His own view was that the index, if generally adopted, would eliminate many of the objections which had been urged to the proposal of calculating by therms. Reference had been made as to the absence on the market of a satisfactory calorimeter. His firm had been experimenting in that direction for the past two years; and he believed they had now got what was considered to be a satisfactory calorimeter. It was fairly accurate, having proved itself to be so after repeated tests.

The President said the question of cost in the purchase of a calorimeter had not anxiously weighed with him. He did not want to get a calorimeter until he could be sure that it was likely to be recognized as a standard instrument. It was for this reason he had stuck to the jet photometer. He saw no good in buying a calorimeter and finding a year or two later that it was not regarded as meeting the standard.

The President was afterwards cordially thanked for his paper; while Mr. A. Dow, on behalf of the members, presented him with the gold medal of the Association.

Sympathetic reference was made by Mr. Scott (Messrs. Alder and Mackay) to the death of Mr. M'Given, of Wick, who as far back as 1900 had been President of the Waverley Association. The Secretary was instructed to transmit to the widow and family a letter of condolence and sympathy.

It was remitted to the Committee to arrange the venue of the next annual meeting; the President-Elect (Mr. Macdonald) explaining that he would possibly have an invitation to the members from a town within easy reach of Edinburgh.

In the afternoon the members enjoyed a motor charabanc drive to Howes Pier, South Queensferry. This was followed by a pleasant motor yacht cruise. Capital arrangements for the outing and meeting were made by the Secretary (Mr. R. J. Philp).

COLLIERY YEAR BOOK AND COAL TRADES DIRECTORY.*

It is a common human tendency to appreciate to the full either that which is irrevocably lost, or that which is passing away from our grasp. During the past decade, we have realized more and more the immense value of our coalfields; and consequently greater interest than ever has been taken in the coal and gas industries. As a sign of the times, we have received from the Louis Cassier Company, Ltd., the first issue of the "Colliery Year Book and Coal Trades Directory." The work entailed in its preparation must have been considerable; and the publishers have given "good measure, pressed down, and running over" in the eight hundred pages of the new volume.

The main feature of the book is a complete list of all the colliery owners in the kingdom, giving detailed information of the various concerns. A series of articles contributed by acknowledged authorities covers, to no small extent, the field of coal production and distribution. All the most important coal consumers appear in the directory, which includes a full list of gas companies. Among other features may be mentioned the biographical notes of leading personalities connected with the colliery trades; while regulations regarding the management and operation of the coal mine complete the volume.

The nature of the publication defies adequate treatment in a short review. Of course, most of the articles will have the strongest appeal to the mining engineer; but a few of them will be of much value to those whose interest lies in the gas industry. In a well-written article on low-temperature carbonization, it is pointed out that during the last eighteen months there has been a marked decrease in the price of fuel oil. The bearing of this fall in price upon schemes for low-temperature carbonization is shown when it is stated that this represents a drop of at least 10s. on the value of the fuel oil obtainable from one ton of coal. A paragraph in this article immediately strikes the technical reader. "No one who is in intimate touch with the gas industry would to-day suggest that any system of carbonization at 600° C. is likely to supersede the present gas-works practice of carbonization and gasification at 1100 to 1300° C. We cannot, however, ignore the fact that the widest and most natural outlet for the rich gas from carbonization at 600° C. would be as an enriching agent. . . . The process as an industrial operation will stand or fall on a perfectly definite issue, which is whether or not it is possible to evolve an apparatus on sound engineering lines in which the capital and working costs will fall within the modest margin of working profit on which the industry must be founded."

Another question of import to the gas engineer is treated in an article entitled "Fuel Purchase." This is by no means an easy problem; but it is one which we have long felt has received an attention all too scanty. The writer of the article provides no "cookery book" recipe for the buying of coal, but indicates the factors which should invariably receive attention. In our columns we have emphasized, not once but many times, the importance of avoiding a cramped outlook and the necessity for a due regard of ultimate economy; and if instead of being the first consideration in selecting a suitable fuel, the price was the last determining factor, to be applied after a thorough investigation on technical grounds, then perhaps we should make yet another step towards the ideal. Here again a sentence stands out with prominence: "Owing to the fact that the purchase of coal is in the hands of those who, however capable in their own sphere as commercial men, are lamentably ignorant of the technical depth of the numerous problems connected with the correct selection of fuel as a commercial proposition, there are enormous quantities of coal burned daily at low efficiency in totally inappropriate apparatus."

Enough has been written to indicate the character of the new issue; and we hope that it will be assured of that measure of support which will extend its usefulness.

* "The Colliery Year Book and Coal Trades Directory, 1923." London: The Louis Cassier Company, Ltd., 34, Bedford Street, Strand, W.C. 2. Price, one guinea net.

RESEARCH SUB-COMMITTEE OF THE GAS INVESTIGATION COMMITTEE OF THE INSTITUTION OF GAS ENGINEERS.

The "Fairweather" Recording Calorimeter.

EIGHTH REPORT.

(*Continued from p.* 600.)

APPENDIX 1.

By kind permission of Mr. Charles Fairweather, of Scientific and Projections, Ltd., we have been able to include with our report the following brief description of the "Fairweather" Continuous Recording Gas Calorimeter, and the theory underlying its construction and operation, as put forward by the makers. Naturally, the Committee cannot be

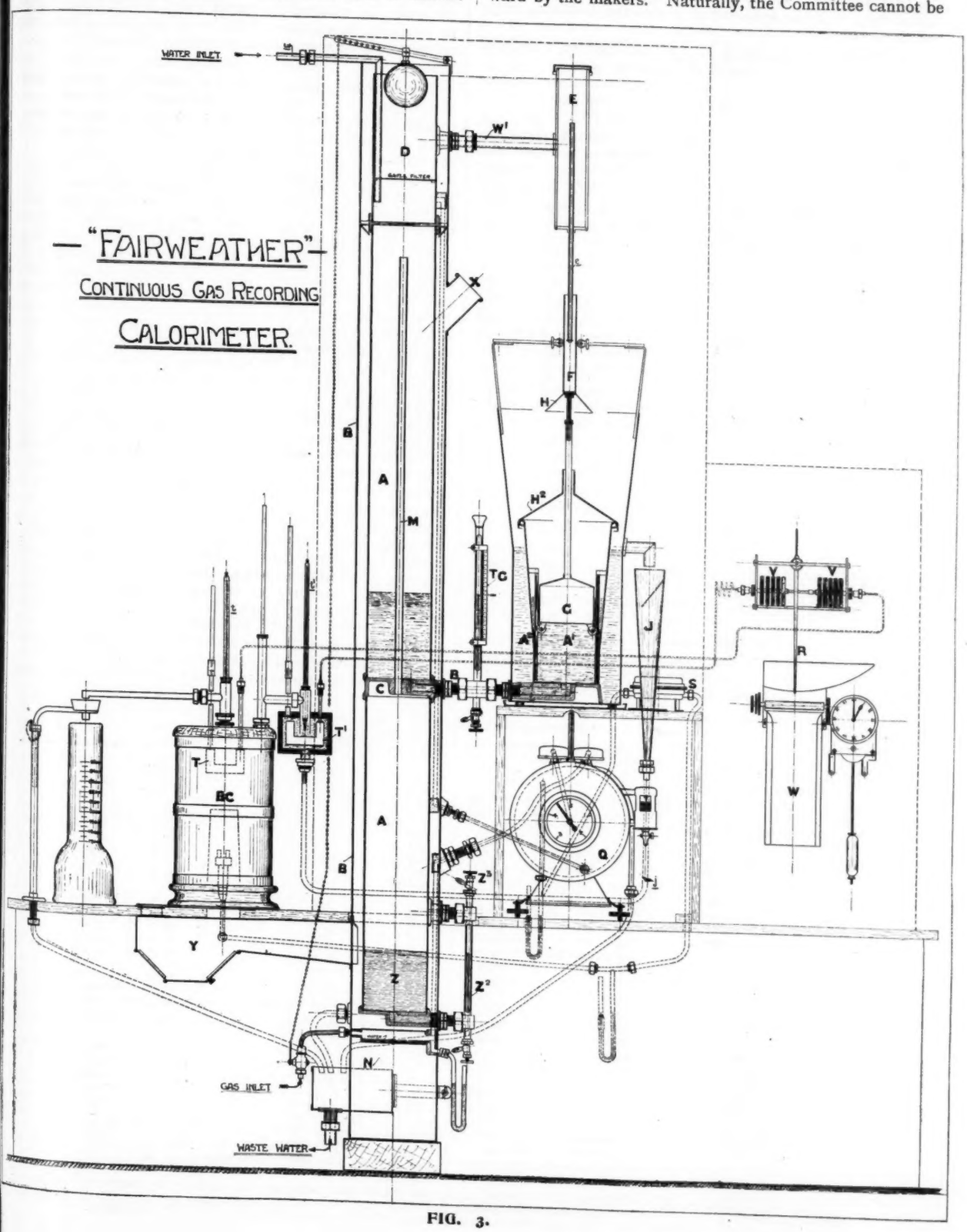


FIG. 3.

held responsible for statements and opinions expressed therein, although on the whole it appears to be an excellent and concise description of the recorder.

"FAIRWEATHER" CONTINUOUS RECORDING GAS CALORIMETER.

THEORY OF THE INSTRUMENT.

INTRODUCTORY.

The instrument comprises, briefly, a water-flow calorimeter of the Boys type, adapted to record continuously the total heat value of the gas, reduced to standard temperature and pressure (60° F. and 30 in. mercury).

This automatic and continuous operation is effected by combining with the calorimeter proper the following automatic devices:

(1) Means for supplying to the calorimeter a definite and measured water flow, combined with
(2) Means for automatically adjusting such flow to compensate for the tabular condition of the gas.
(3) A time-controlled wet meter adapted to supply gas uniformly to the calorimeter at a constant rate.
(4) A recording thermometer adapted to indicate the temperature rise imparted to the water passing through the calorimeter. In view of (1) to (3), this temperature rise is a direct measure of the calorific value of the gas, and is converted to B.Th.U. by appropriate ruling of the record chart.

1.—ACCURATE WATER SUPPLY.

A definite flow is accurately supplied to the calorimeter by passing the water through a small orifice under a head of pressure. Referring to the diagram (fig. 3), water is supplied by a pipe *w* to an open vessel D connected by a pipe W^1 to a second vessel E from which depends a tube *e* fitted at the lower end with a small orifice and dipping into a cup F into which the water flows, filling the cup and overflowing the rim thereof. The water overflows the vessel D, which thus acts as a weir and determines the level of the water in the vessel E—such level being, of course, constant. Consequently, the orifice is under a head of pressure equal to the vertical height between the level of the water in the vessel E and that at the rim of the cup F (both of these being at atmospheric pressure). With such an arrangement, the flow in unit time is given by the following formula:—

$V = E \sqrt{h}$ where V = volume in c.c.'s in unit time.
h = the head of pressure.
E = a constant, depending upon the size of the orifice.

The cup F is carried by a float G supported in an oil chamber A^1, the level of the oil—which, of course, indicates the position of the cup—being shown on a gauge TG. This gauge is graduated to show proportional flows—*i.e.*, the relative flow at different levels of the oil. The cup is so set upon the float that with the gauge reading 1·000 the water flow per 4 minutes is exactly 2000 c.c.'s. If the oil level be altered to any other reading, the flow is altered accordingly, or, in other words, the flow is always 2000 times the gauge reading, thus:—

Gauge Reading.	Water Flow. (c.c.'s/4 min. at 15° C.)
1·000	2000
1·035	2070
·941	1882

This water control works very accurately, and is substantially not affected by variations of water temperature. In checking flows, due regard must be paid to the water temperature, *all flows being corrected to* 15° C.

2.—TABULAR CONTROL.

The foregoing shows how the water flow is accurately determined (*i.e.*, by the orifice and cup device) and is also capable of adjustment (*i.e.*, by alteration of the oil level). Such adjustment is effected automatically to compensate for the tabular condition of the gas. The oil is acted upon by a volume of saturated air enclosed in a vessel A supporting the vessel D. This air is brought to the water temperature by the excess water overflowing the vessel D passing down the sides of the vessel A; and is also subjected to atmospheric pressure through the oil (the float chamber A^1 being open to the atmosphere). Consequently, the level of the oil is raised or lowered as the air expands or contracts owing to changes in the temperature and atmospheric pressure. Now the tabular number of a gas is merely the reciprocal of its volume relatively to the corresponding volume under standard conditions of temperature and pressure (60° Fahr. and 30 in.). Hence the gauge can be fitted with a *tabular* scale—*i.e.*, the air vessel and gauge can be employed as an aerorthometer. To adjust the water flow to compensate for the tabular number—*i.e.*, to make it exactly proportional to the tabular number, it is only necessary that the proportional flow scale should itself constitute the tabular scale. This is effected by the special design of the float chamber outlined on the diagram. Although the oil is moved by the air, the gauge can be, and actually is, set to the tabular number of the gas as measured in the meter. As will be explained later, the temperature of the gas in the meter is brought to within 1° Fahr. of the water temperature, and as the inlet pressure is steady at about 0·1 in. mercury above atmospheric pressure, by setting the gauge to the gas, it means that the gauge reading is set up to about 0·002 above the atmospheric value. This setting is permissible, and, moreover, ensures that the water flow is adjusted accurately and automatically to the gas as measured in the meter.

The water measured out by the orifice and overflowing

"Fairweather" Recording Calorimeter.

Table of Temperature Differences (Hot – Cold) and Equivalent B.Th.U. Values.

Temperature Difference (H – C).	B.Th.U.	Temperature Difference (H – C).	B.Th.U.	Temperature Difference (H – C).	B.Th.U.	Temperature Difference (H – C).	B.Th.U.	Temperature Difference (H – C).	B.Th.U.
15·0	357·1	17·0	404·7	19·0	452·3	21·0	499·9	23 0	547·5
15·1	359·5	17·1	407·1	19·1	454·7	21·1	502·3	23·1	549·9
15·2	361·9	17·2	409·5	19·2	457·1	21·2	504·7	23·2	552·3
15·3	364·3	17·3	411·9	19 3	459·5	21·3	507·1	23·3	554 7
15·4	366·7	17·4	414·3	19·4	461·9	21·4	509·5	23·4	557·1
15·5	369·0	17·5	416·5	19·5	464·2	21·5	511·8	23·5	559 4
15·6	371·4	17 6	419·0	19·6	466 6	21·6	514·2	23·6	561·8
15·7	373·8	17·7	421·4	19·7	469·0	21·7	516·6	23·7	564·2
15·8	376·2	17·8	423·8	19·8	471·4	21·8	519·0	23·8	566·6
15·9	378·6	17·9	426·2	19·9	473·8	21·9	521·4	23·9	569·0
16·0	380·9	18·0	428·5	20·0	476·1	22·0	523·7	24·0	571·3
16·1	383·3	18·1	430·9	20·1	478 5	22·1	526·1	24·1	573·7
16·2	385·7	18·2	433·3	20·2	480·9	22·2	528·5	24·2	576·1
16 3	388·1	18·3	435·7	20·3	483·3	22·3	530·9	24·3	578·5
16·4	390·5	18·4	438·1	20·4	485·7	22·4	533·3	24·4	580·9
16·5	392·8	18 5	440·4	20·5	488·0	22·5	535·6	24·5	583·2
16·6	395·2	18·6	442 8	20·6	490·4	22·6	538·0	24·6	585·6
16·7	397·6	18·7	445·2	20 7	492·8	22·7	540·4	24·7	588·0
16·8	400·0	18·8	447 6	20·8	495·2	22·8	542·8	24·8	590·4
16·9	402·4	18·9	450·0	20·9	497·6	22·9	545·2	24·9	592·8

Scientific & Projections, Ltd.,
Crawford Passage,
Farringdon Road, E.C. 1.

NOTE.—This table has apparently been laid out on the assumption that the calorific value of the gas is strictly proportional to the temperature rise in the calorimeter (when the proper operating conditions have been realized) with a temperature rise of 21·0° C. for a gas of 500 B.Th.U. gross per c.ft. Note that a temperature difference of 0·1° corresponds with 2·38 B.Th.U. throughout.

the cup F is diverted by a baffle H and cover H^2 into a vessel A^2 surrounding the float chamber, and passes thence through a funnel J and pipe *j* to the calorimeter.

3.—GAS SUPPLY.

The gas is measured accurately by a "Parkinson" escapement meter Q. To ensure accurate measurement, the gas is first passed through a cooling box N before entering the meter and the meter itself is fitted with a special water-jacket which ensures that the gas is measured at a temperature closely approximating to that of the water—*i.e.*, within 1° F. By these precautions, the chief source of error in this type of meter, *i.e.* the loss of water from the meter by reason of evaporation, is largely eliminated, the water-line of the meter only requiring occasional setting. To ensure uniform movement, it is only necessary that the gas be delivered to the meter at a steady pressure of 3-3½ in.* of water; beyond this, timing is merely a matter of adjusting the pendulum. The meter is fitted with a two stage governor, which brings the inlet pressure, under which the gas is measured, to a steady figure of about 12-10ths ins. of water (*i.e.*, 0·1 in. mercury, which should be added to the barometer).

4.—RECORDING MECHANISM.

The calorimeter BC, to which gas is delivered from the meter Q and water through the pipe *j*, is fitted with the ordinary mercury thermometers *t* and t^1, and in addition, thermometric air boxes T and T^1 are arranged in the hot and cold flows respectively. These boxes are well insulated against radiation and are connected by fine copper tubing to a pair of opposed aneroids V which operate a pen R moving over a record chart W.

As explained above, the temperature rise imparted to the water is a direct measure of the calorific value of the gas, and is translated into B.Th.U. by the pen mechanism and chart. The temperature rise, *i.e.*, the difference between the readings of the hot and cold thermometers, can be converted into terms of B.Th.U.'s by reference to the Heat Value Conversion Table supplied with the instrument. This also forms a means by which the pen recorder readings may be verified. (See p. 678.)

AIR FOR COMBUSTION.

The air vessel A is surrounded by a casing B fitted with an elbow X through which air for combustion is drawn and passes into a closed channel Y beneath the calorimeter. The air is consequently cooled to the water temperature and saturated with water vapour. Saturation may be taken at 100 p.ct.

HEAT BALANCE OF GAS AND AIR AND EXIT GASES.

As the gas and air are both cooled to the water temperature and are also saturated, it is merely a question of balancing the heat content of the combined volumes of gas and air entering the calorimeter against that of the exit gases. The following table shows the value in B.Th.U. of the heat content per c.ft. of saturated air or gas and in the last three columns, the heat balance per c.ft. of gas in which the ratio of air to exit gases is 7·1/6·6.

Temp. °C.	B.Th.U. per C.Ft.	Heat Given up to Calorimeter for Temperature Difference.		
		2° C.	3° C.	4° C.
10	0·63	0·4	0·1	— 0·2
12	0·71	0·5	0·2	— 0·1
14	0·80	0·6	0·2	— 0·2
16	0·90	0·6	0·2	— 0·2
18	1·01	0·7	0·2	— 0·3
20	1·14	0·7	0·2	— 0·3
22	1·28	0 9	0·3	— 0·3

* This value has since been reduced to 2½ ins. water-gauge, and is the pressure at inlet dry governors and *not* at inlet meter.—J.W.W.

Gas-Meter Thefts.—At Dronfield (Derbyshire) on Friday, Thomas Burton was charged with stealing 22s. from a gas-meter, the property of the Dronfield Gas Company, and also with damaging the lock of the meter. Defendant pleaded guilty, but said he took the money on a week-end when he had no wages to draw. He was a discharged ex-serviceman and had a family of twelve. He came home on the Saturday night and found neither fire nor food in the house. In a fit of desperation he opened the meter, and bought the children some food. He was sentenced to one month's imprisonment with hard labour. William Morley, Nottingham, was charged on Friday at Chesterfield (Derbyshire) with stealing 18s. 3d. from a gas-meter. Defendant was sent to prison for three months with hard labour.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

National Association of Technical Gas Officials.

SIR,—May we for the last time encroach upon your space on behalf of the National Association of Technical Gas Officials.

In previous letters which you have been good enough to publish, and in your report of the annual general meeting of the Association in London last June, the position and progress of the Association to that date have been clearly placed on record. We are pleased to be able to say that the financial difficulties were quickly overcome by the loyalty of its members; and to-day, after a further twelve months, the Association is solvent. When this happy result was achieved, it was thought the time had come again to approach the Council of the Institution of Gas Engineers, as the affiliation of the two bodies was so obvious and desirable a course to be adopted. Negotiations have been protracted. The net result can best be told by the copies of the Association's approach to the Council of the Institution, and the final reply of the latter, which we enclose for publication with this communication.

The Executive Committee of the Association considered the position created. They felt no good purpose could further be served to the profession by the Association's continued existence, and advised the General Council and the members accordingly. The members have, therefore, now decided to dissolve the Association. It may interest you to know that by resolution of the Executive Committee, any funds finally in hand will be contributed to the Benevolent Fund of the Institution.

Thus passes out of existence the only attempt that has been made to strengthen the weakest spot in the industry; an attempt that has received the blessing of Presidents of the Institution—the last in 1921, when Mr. Thos. Goulden heartily "wished the work of this Association every success in the object they have in view of creating a better practical knowledge where it is necessary, and a more correct appreciation of the valuable services rendered by engineers . . . ." It passes out of existence for the want of sufficient support from those it endeavoured to benefit, and more particularly of those who needed no help but might have been expected to assist their less fortunate brethren, and the conservatism of the Council of the Institution in persistently refusing to allow the members the opportunity of deciding whether the precedent already made by the National Gas Council should be followed.

We thank you, Sir, for your past support.

R. G. SHADBOLT,
Chairman of General Council.

FRAS. C. BRIGGS,
Chairman of Executive Committee.

75, Trafalgar Road, Moseley, Birmingham, June 5, 1923.

The following is the correspondence referred to in the above letter.

NATIONAL ASSOCIATION OF TECHNICAL GAS OFFICIALS.

Gas-Works,
Spring Gardens, Dudley,
Oct. 31, 1922.

W. T. Dunn, Esq , Secretary,
The Institution of Gas Engineers,
28, Grosvenor Gardens,
Westminster, S.W. 1.

Dear Sir,

Members of the Council of the Institution will know from reports and correspondence in the Technical Press, that the above Association decided to go into a state of temporarily suspended animation, for financial reasons. The expense of an independent office, paid Secretary, &c., inseparable from such an Association, crippled its activities at a time when the Association, being a new one, was receiving an amount of moral support very gratifying, but much larger than the financial help received from the profession. These financial difficulties have now been overcome by the loyalty of its active members, and the Association is again solvent.

Before deciding upon a future course of action, we feel compelled again to approach the Institution with a view to the merging into, or affiliation with, the Institution. We are greatly encouraged in this by the recent definite educational scheme issued by the Institution for consideration. If the Institution has been willing, and very rightly in the Association's opinion, to travel thus far from the original views and intention of the members in the past, it seems surely but a step further to endeavour to protect the interests of gas engineers who have profited by the educational scheme, and so ensure its enthusiastic acceptance by the right type of youth. We may take the opportunity of saying that when the present Executive Committee was appointed, it seriously considered the educational side of the Association's aims. But knowing the Institution's scheme was far advanced, it decided it could best help the profession by waiting for the full details to be published rather than attempt to propose any scheme of its own.

As to the suggested merger, the idea that has already been mooted is that in the same way as the National Gas Council had originally a Committee of Gas Employers (which has now become the Federation of Gas Employers) to which members of the former body could or need not be parties, as they wished, so the Institution of Gas Engineers might form a Committee or Section of Technical Gas Officials.

The scheme would have the support, we are sure, of our own members, and presents on the surface very many advantages. The Institution, as the representative body of technical men, would be doing a work for its members that has been badly needed for some years, which need has been admitted by its own past Presidents; and the experience and

dignity of the Institution would leaven the enthusiasm of the younger members of the profession and obviate some of those errors of judgment that have at times marred the Association's record of really good service.

If there be any rule in the constitution of the Institution whereby such an arrangement is impossible, we beg to suggest that the time is ripe for the members to be given the opportunity of amending this. We assure you of our support to any reasonable scheme of this kind, and we request you to bring the matter to the notice of your Council, the members of which, we are convinced, will give it their serious and impartial consideration. As an indication of the possible lines on which such a Committee or Section could be laid, we enclose herewith a copy of the rules and objects of the present Association.

Faithfully yours,

(Signed) R. G. SHADBOLT,
Chairman of General Council.

(Signed) FRAS. C. BRIGGS,
Chairman of Executive Committee.

THE INSTITUTION OF GAS ENGINEERS.

28, *Grosvenor Gardens*,
Westminster, S.W. 1,
Feb. 19, 1923.

F. C. Briggs, Esq.,
Gas-Works, Dudley.

Dear Sir,

NATIONAL ASSOCIATION OF TECHNICAL GAS OFFICIALS.

With further reference to your letter of Oct. 31 last, which has received the earnest consideration of a Committee of the Council, and of the Council itself, I am directed to say that the constitution of the Institution precludes the possibility of its entering into any such scheme as suggested by your Association, and that the Council do not consider the time opportune for reviewing such constitution.

Yours faithfully,

(Signed) W. T. DUNN,
Secretary.

"Field's Analysis."

SIR,—I was interested in reading the letter in your last issue from Mr. H. E. Jones dealing with some of the figures contained in "Field's Analysis."

Mr. Jones intimates that costs should be calculated on the calorific value of the gas supplied rather than on the declared calorific value. This particular point was raised by me in the "JOURNAL" so long ago as June, 1921. I was then unable to obtain the opinion of the industry generally on the subject; but from those who were good enough to give me their views privately, I gathered that the "declared" would be the more satisfactory basis to adopt.

At the end of his letter, Mr. Jones gives some figures with regard to the number of therms made per ton of coal. May I point out that in the case of those undertakings making both coal and carburetted water gas the calorific value of the mixed gas is not the correct factor to take when ascertaining the therms made per ton of coal. During 1922 the therms made by the Gas Light and Coke Company were approximately 70, and not 63 as stated by Mr. Jones.

W. E. IBBS.

Gas Light and Coke Company, Horseferry Road, Westminster, S.W., June 8, 1923.

SIR,—The letter in your last issue from Mr. Harry Jones is most significant at this juncture. It says a good deal to those who can read it.

Among other things, it demonstrates clearly that from figures alone there is no royal road to a comparison of processes or working. How are the figures shown to be reconciled one with the other? I am adding Bath:

Selling Price of Gas.

	Per Therm Sold. d.		Per 1000 C.Ft. d.
South Metropolitan (lowest price)	10·175	..	56·46
South Suburban (highest price)	13·162	..	60·55
Bath	6·706	..	32·19

Net Cost of Coal.

South Metropolitan (lowest cost)	2·468	..	—
Brentford (highest cost)	4·142	..	—
Bath	1·235	..	—

Profit.

South Metropolitan (least profit required)	2·002	..	9·21
Croydon (most profit required)	2·852	..	13·69
Bath	0·880	..	4·25

I am leaving out the therms made per ton because most of the works use carburetted water gas, and I do not quite see how the oil can be converted into tons of coal. The South Metropolitan Gas Company make 70 therms per ton of coal—without oil. The Gas Light and Coke Company make 63 therms—with or without oil? The Bath figure I cannot give.

Personally I am particularly struck by the remark of Mr. Jones: "The surprise of my life is the contentment shown so widely with declarations of 450 and 460 B.Th.U."

This is not the first time that Mr. Harry Jones has used his pen in the proclaiming of a great truth, than which nothing is more potent. Long may he live!

GEO. HELPS.

Gas Offices, Nuneaton, June 9, 1923.

Tully Gas Plants, Ltd.

SIR,—The Daily Press of June 4 and 5, and your issue of June 6 contain an offer of new share capital in Tully Gas Plants, Ltd., for the quite legitimate object of extending and enlarging the scope of their business. The prospectus, however, contains statements which by inference suggest that the elimination of carbon monoxide from town gas is a most desirable object, and largely influences the choice of those gas engineers who have so far adopted the plant and process.

I quote from your own issue, p. 616; the second paragraph having prominent heavy type:

> "In adopting the Tully Plants, gas companies have been influenced, amongst other reasons, *by the relatively small proportion of carbon monoxide in the gas produced*. [Italics my own.] The low-temperature process gives still less carbon monoxide, and the combined plant produces a mixed gas which satisfies the requirements both of the gas companies and of the public."
>
> "The readiness of gas companies to adopt a plant which reduces the carbon monoxide content of town gas to a margin of safety is indicated by the numerous offers of support which I have recently received from leading gas managers and engineers."

Another paragraph follows indicating the extent of the conversion, which need not be quoted in full.

The above quotations are Mr. C. B. Tully's own words, as Managing Director of Tully Gas Plants, Ltd., to Coal Gas and Electric Investment, Ltd., the present promoters; so he cannot plead ignorance.

The same prospectus quotes Mr. J. B. Hansford, of Bedford, on his results obtained from a set of modern Tully plants recently erected. In your issue of May 16, pp. 420-22, appears an article on the inspection and working results of the Bedford plant, from which it appears that the Tully plants at Bedford provide practically half the total gas supply of the town. An analysis of Tully gas shows 37 p.ct. of carbon monoxide, so that by inference there is approximately 22 p.ct. of carbon monoxide in the mixed town gas as supplied at Bedford. It would be interesting to hear Mr. Hansford's opinion as to whether the reduction and conversion of carbon monoxide to hydrogen in his gas had any serious influence when buying his Tully plants.

Mr. Tully appears to have two voices; and it would be interesting to hear from him to which voice he desires gas engineers to listen, for obviously the business of Tully Gas Plants will flourish enormously if the goodwill of gas engineers is won straight. For instance, in your issue of May 30, pp. 542-3, there appears a letter above Mr. Tully's signature, and headed "Who is Mr. C. K. S. Hills?" A few quotations from that, Mr. Editor, leave one guessing exactly which voice Mr. Tully speaks with, and whether he does not think it more dignified to come down off the fence on one side or the other. *Vide* Mr. Tully—

> "I never have, and never shall, advocate the removal of CO; it is of far too much value—it is absolutely necessary for industrial gas, on account of its high calorific intensity.
>
> "My opinion is that there is too much fuss made about carbon monoxide; and the gas industry had better educate the public. . . . Why not tell the latter that the illuminating effect of carbon monoxide in incandescent mantles is 48 p.ct. greater than that of hydrogen . . . that it takes less air for combustion . . . renders gas easier to burn, and less liable to waste or give off fumes. Its removal will mean larger gas bills and dearer gas. The British public are not fools."

Possibly not, Mr. Editor; again, possibly they are—let's wait and see. It might have been generous to include "and gas engineers;" but let that pass.

Now I think it is a fair and legitimate question to ask Mr. Tully exactly where he stands regarding his attitude to those upon whom he most relies for making his business a financial success. Is his letter to you of May 28, or his report to Coal Gas and Electric Investments, Ltd., for prospectus and capital-raising purposes, his correct attitude? Is it not rather of the nature of fouling one's own nest to endeavour to keep alive those public prejudices and groundless fears of carbon monoxide? Does he think that by so doing he will bludgeon the gas industry into adopting his plants willy-nilly, irrespective of other considerations? Is every one of those towns quoted by him prepared to give the plant a clear and unequivocal certificate of competency? If so, say it. If not, then let them take their courage in their hands and say what they know regarding the pros and cons. It may clear a very thunderous atmosphere, and assist their colleagues to a fuller understanding of the issues involved. If it is a good thing, then let it be blazed from the retort-house top, and the higher the better!

J. F. TYNDALL.

Deal and Walmer Gas and Electricity Company, June 9, 1923.

The Tully CO Process.

SIR,—With reference to the invention of Mr. Tully relating to the production of hydrogen, as described in your issue of May 23, it may be of general interest, in view of the discussion which has arisen regarding the process, to recall that the Rincker complete-gasification plant has been used for the production of hydrogen from coke and crude petroleum oil in a much simpler apparatus, and without catalysis of CO.*

The Rincker plant was built previous to, and during, the war in portable form, mounted on a railway truck, and used by the Germans for balloon work. It produced hydrogen of 98 to 99 p.ct. purity; being required to fulfil a guarantee of six days and six nights working without interruption, and generate hydrogen of a sp.gr. not exceeding ·09. The capacity of the portable units was 112 cub. m. per hour, and the sp. gr. of the gas was ·08 to ·087.

The new features in Mr. Tully's plant are therefore the use of coal, and the catalyzing chamber; and as it is stated that fuel oil or crude petroleum may be introduced to increase the percentage of hydrogen, anyone who has had experience of the working of contact plants may

* A description of the Rincker process of complete gasification appeared in the "JOURNAL" for Aug. 30, 1922, p. 473.—ED. "G. J."

venture to predict that the process will eventually be simplified by working with coke and oil as raw materials.

Possibly Mr. Tully's invention may ultimately prove of some commercial value as a producer of hydrogen for extraneous processes such as the hydrogenation of fats, production of synthetic ammonia, in aeronautics, &c.—which is all very interesting, but not of any practical assistance to the gas industry. Apparently it is the catalytic reaction which Mr. Tully suggests will interest gas engineers. If so, it appears desirable that he should issue a comprehensive description of its application to gas-works practice. Most technical people are aware that (*a*) CO and H_2O can be catalyzed to CO_2 and H_2, or (*b*) CO and H_2 to CO_2 or H_2O and CH_4; but they also know in (*a*) it is a case of "as you were" from a thermal point of view (neglecting the steam put in, which presumably is to be obtained by waste heat), and in (*b*) there is a considerable loss of heat units. In addition, the impurity, CO_2, is equal in volume to the hydrogen or methane obtained.

Mr. Tully has stated that he is an advocate of the retention of CO in town gas. He also states that he is designing converter plant suitable for any size of gas-works. Can he not spare the time to tell us exactly what he is after, and what advantage, if any, he suggests will accrue to the gas industry from the catalysis of carbon monoxide, so that gas engineers may be truly thankful (or otherwise) for what they are about to receive?

A. MACGREGOR.

43, *Whitelow Road, Chorlton cum-Hardy, Manchester, June* 9, 1923.

Yorktown Gas Order.

In our report of the proceedings on this Order at the inquiry at the Board of Trade (*ante*, p. 612), Mr. D. H. Helps was reported as having said that he regarded the supply of gas in an urban district as a much more simple problem than the supply of gas in a rural district. His reply to Counsel was exactly the opposite—viz., that the problem is much more simple in the case of a rural supply.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Hoylake and West Kirby Gas and Water Bill: Read the third time, with the amendments. Further amendments made; Bill passed, and returned to the Commons.

Rawmarsh Urban District Council Bill: The further Standing Orders applicable to this Bill have been complied with.

South Staffordshire Mond Gas Bill: Read the third time, and passed; sent to the Commons.

Swanage Gas and Electricity Bill: Reported, with amendments.

Royal Assent.

The Smethwick Corporation (Gas) Bill received the Royal Assent on Thursday of last week.

Gas Regulation Act.

In the House of Lords on Wednesday of last week the Earl of Clarendon moved that the draft Special Orders proposed to be made by the Board of Trade under section 10 of the Act on the application of the Swindon United Gas Company, Hatfield Gas Company, Colwall Gas Company, and the Southend Gas Company, be approved. This was agreed to. A similar motion was made by Viscount Wolmer in the House of Commons, and passed.

A copy was presented of a draft of a Special Order proposed to be made by the Board of Trade under section 10 of the Act, on the application of the Ipswich Gas Light Company.

HOUSE OF COMMONS.

Progress of Bills.

South Elmsall and District Gas Bill: Read a second time, and committed.

South Staffordshire Mond Bill: Read the first time, and referred to the Examiners.

Standing Orders.

The Standing Orders not previously inquired into, which are applicable to the Lytham St. Anne's Corporation and the Plymouth Corporation Bills, have been complied with; and they have been sent forward for second reading.

Barnsley Gas Company's Special Order.

Viscount WOLMER, in the House of Commons on Tuesday of last week, moved that the draft of a Special Order proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act, 1920, on the application of the Barnsley Gas Company be approved.

Mr. POTTS moved an amendment to leave out the word "approved" and to add

> referred to a Select Committee of four members appointed by the Committee of Selection for their report, which shall state whether, in their opinion, the Order should be approved, with or without modifications or additions (setting out the modifications or additions, if any) which they propose, or should not be approved, and shall be laid before the House, together with a copy of the Order showing the modifications and additions, if any, proposed by the Committee. That the proceedings of the Committee to which the Order is referred shall be conducted in like manner as in the case of a Provisional Order Confirmation Bill under Standing Order 151, and opponents of the Order shall be heard provided that a statement of objection has been deposited with the Board of Trade on or before the seventh day after the date of this motion, but an opponent shall only be heard upon objections which have been distinctly specified in the statement.
>
> Any statement so deposited shall be laid upon the Table of the House by the Board of Trade and shall stand referred to the Committee.
>
> If no statement of objection shall have been deposited within the specified time, the reference to the Select Committee shall be discharged.

Mr. T. WILLIAMS seconded; and the question, as amended, was put and was agreed to.

Harwich Gas and Coke Company's Special Order.

Viscount WOLMER moved that the draft of a Special Order proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act, on the application of the Harwich Gas and Coke Company, be approved. There was considerable discussion on the motion, referring chiefly to the site on which it is proposed to erect additional works. On the question being put, the House divided; the "Ayes" having the majority.

Gas (Carbon Monoxide).

Lieut.-Colonel Sir P. RICHARDSON asked the President of the Board of Trade whether he had caused any investigations to be made into the experimental gas plant erected at Newark-upon-Trent, wherein it was claimed that a non-poisonous gas had been produced; and whether there was any probability of such a gas being generally available for commercial and domestic purposes at a price which would not be disadvantageous to the consumer?

Sir WILFRID SUGDEN inquired whether the President's attention had been drawn to the description in the Press of a method of treating gas, proposed by Mr. Tully, whereby, so it was alleged, the percentage of carbon monoxide was very greatly reduced; whether he had any information as to the practicability of producing such a gas upon a commercial scale; and whether the so-called Tully gas was in fact non-poisonous, or whether it was a gas obtained from the complete gasification of coal, which contained about 30 p.ct. of carbon monoxide?

Sir P. LLOYD-GREAME replied that the latest analysis which he had seen of gas produced by the Tully plant at present in industrial use (which was published in the "GAS JOURNAL" of May 16) gave the carbon monoxide content as 37 p.ct.; but he observed in a prospectus just issued that it was stated that by means of a new converter the carbon monoxide content could be reduced to a negligible quantity. He was not in a position to express an authoritative opinion as to the practicability of producing town gas on a commercial scale by the new process. The matter was, however, being carefully watched by the Government Departments concerned.

Sir H. BRITTAIN: Is the right hon. gentleman aware that the inventor has taken, and is taking, orders to supply this gas, with a guarantee as to the amount of carbon monoxide?

Sir P. LLOYD-GREAME: I have given all the facts of which I am aware. If any experiments are carried out, they will be very closely watched with great interest.

Gas-Mantles.

Major ENTWISTLE asked the Chancellor of the Exchequer whether he was aware that the German Government now prohibit the export to this country of gas-mantles and glassware on any other basis than sterling, and that the British Customs would not allow the import of such goods unless they were valued on a sterling basis; and whether in these circumstances the Government were prepared to suspend the working of Part II of the Safeguarding of Industries Act in so far as it applied to these commodities?

Sir P. LLOYD-GREAME, replying to the question, said the export from Germany of the articles mentioned was at present subject to control; but he had no information to confirm the statement that invoicing in sterling was invariably insisted upon as a condition of the grant of permission to export. He was informed that it was the general practice of His Majesty's Customs to require an invoice in sterling. The answer to the last part of the question was in the negative.

OAKHAM GAS AND ELECTRICITY BILL.

This Bill [see "JOURNAL" for May 2, p. 297] came before the Unopposed Committee of the House of Commons, presided over by Mr. J. FITZALAN HOPE (Deputy Speaker), on Wednesday last.

Mr. SEDGWICK (Messrs. Rees and Freres, Parliamentary Agents) explained the provisions of the Bill, the sole object of which, apart from finance, was to empower the Oakham Gas Company to supply electricity in their present gas area, which is the urban district of Oakham and part of the rural district of Oakham. There had been no opposition to the Bill except on the part of railway companies; and a clause had been agreed between the Gas Company and the Railway Companies. This provided that sub-stations, transforming stations, or other works were not to be constructed within 25 yards of a railway or railway works, except with the consent of the railway company concerned, which consent should not be unreasonably withheld. Also, that nothing in the sections of the Bill giving power to lay electric mains and gas-pipes in private streets should apply to any existing street belonging to, and forming the approach to any station or depot of, a railway company except with consent, which must not be unreasonably withheld, and the Gas Company must not cause unreasonable obstruction. Failing agreement, the provisions of the Abitration Act of 1889 were to apply. It was proposed that electricity should be generated at the existing gas-works of the Company by means of gas-driven engines, and, owing to the fact that the generation of electricity and the manufacture of gas would necessarily be mixed together it was suggested that if the local authority exercised their rights under the Electric Lighting Act to purchase the electricity undertaking (which they were entitled to do at the end of 42 years,

or subsequent periods of 10 years), they should be under an obligation to purchase the gas undertaking at the same time. The promoters felt that this was fair to the Company, so that they should not be in the unfortunate position of developing an electricity undertaking which would be used hereafter in competition with the gas undertaking. It would also be fair to the local authority—and it had been approved by them—because it would be impracticable (he presumed) to buy the electricity undertaking without the gas undertaking.

The CHAIRMAN asked whether there was a precedent for this provision, and Mr. Sedgwick replied that there was not. He had explained the point to the Electricity Commissioners.

Sir ERNEST MOON, K.C., asked for a further explanation of the situation which justified putting this obligation upon the local authority.

Mr. A. H. SEABROOK (Sir Charles Bright and Partners, Ltd., Consulting Engineers), who is the electrical engineer advising the Gas Company on this matter, indicated to the Committee the situation of the gas-works and the proposed electricity works, pointing out that the only site available for the latter was right in the middle of the gas-works. In order to effect the greatest economy and possible reduction in the price of both gas and electricity, the Company wanted to make use of the existing staff and material as far as possible, and the way to do this was to get the gas-works plant and the electrical plant close together.

Sir ERNEST MOON asked whether the waste heat from the retorts was utilized.

Mr. SEABROOK replied that this matter was being considered carefully by gas undertakings; but it only paid the larger concerns to recover and utilize this heat. It would not pay in the case of a small company such as the Oakham Company.

The CHAIRMAN asked whether there was any objection to this combination from the point of view of safety; and Mr. Seabrook said that there was not.

Mr. SEDGWICK, dealing with the therm method of charging, said that the Company had not obtained a therm Order, and one reason was that they had a feeling that the therm system would not be very popular if adopted. The Board of Trade, however, attached importance to this, and a clause had been included, providing that within one year from the passing of this Act an Order was to be applied for.

Discussing Part II., which deals with dividends, &c., and which is to come into force three years after the Company commence to supply electricity, Mr. Sedgwick said that the Company was now a sliding-scale concern. The usual practice for sliding-scale companies was to make electricity dividends also dependent on the sliding-scale when they obtained electricity powers, so as not to have two different forms of capital. This was the form in which the Bill was introduced into Parliament. The Board of Trade, however, had asked the promoters to introduce provisions similar to those recently approved by the Committee in the case of the Hoylake and West Kirby Gas and Water Bill. [See "JOURNAL," Jan. 10, p. 81, and April 18, p. 168.] The Hoylake Company had gas capital subject to a sliding-scale, and water capital subject to a maximum dividend, and they proposed to amalgamate the two. The Oakham Company were in practically the same position, and wished to avoid keeping the two capitals absolutely separate. The proposal was for a common interest and dividend fund to be formed, and the capital of the Company should be allocated to separate accounts for the two undertakings. Out of the profits from the gas undertaking they would transfer to the central dividend account the amount they would be entitled to distribute in dividends under the sliding-scale on the capital allocated to the gas undertaking, and from the electricity profits they would transfer to the central pool dividends calculated at the maximum rates on the electricity capital, if they had earned sufficient to pay the maximum rates. There was a report from the Commissioner of Works with regard to the Bill, stating that the Commissioner had no observations to make. There was also a report from the Minister of Transport. The points raised had been complied with, except in one case; but the Minister did not now propose to press his point.

In reply to the CHAIRMAN, Mr. Sedgwick said the population of the urban district of Oakham was between 4000 and 5000, and that of the outside area was only about 2000.

The CHAIRMAN again raised the question of the purchase clause, and said he understood that, if the local authority exercised its powers under that clause, the property would have to be valued separately in respect of each part of the undertaking.

Mr. SEDGWICK agreed. With regard to the terms of purchase of the electricity undertaking, under the Electric Lighting Act, he pointed out that the Company would get nothing for building-up the business, but simply the value of the undertaking as a going concern.

The CHAIRMAN said the local authority would not be compelled to purchase the electricity undertaking if they wanted to purchase the gas undertaking.

Mr. SEDGWICK agreed, but pointed out that there was no public Act enabling the local authority to purchase the gas undertaking.

Replying to questions as to the price of gas and electricity, Mr. Sedgwick mentioned that the consumers were adequately protected in the case of gas by the sliding-scale, and in the case of electricity by the Minister of Transport. As regards quality of gas, the Company were at present under an obligation to supply at 15 c.p.; but when they obtained the therm Order, they would be entitled to declare their own calorific value.

The CHAIRMAN asked whether the point had been raised as to whether the local authority might have an option to purchase the undertakings by arbitration within a shorter period than 42 years.

Mr. SEDGWICK replied that they had not; it would be very unusual to enforce such a provision on a company unless it were very negligent. In Special Orders the Electricity Commissioners did (by agreement) put in a clause for an earlier date of purchase; but he did not think they did at the wishes of the promoters of the Order only. The Electric Lighting Act of 1882 provided for a 21 years' purchase period; but that had had the effect of killing the industry, and Parliament had introduced an amending Act in 1888, extending the period to 42 years.

Sir ERNEST MOON asked why Parliament should legislate for something which would happen in 42 years.

Mr. SEDGWICK replied that if the Gas Company were to be allowed to build-up an electricity business, it was reasonable that they should be protected against the possibility of finding, in 42 years, that undertaking in the hands of the local authority, competing with their gas undertaking.

Sir ERNEST MOON asked Mr. Seabrook why the electricity undertaking should not be bought separately at the end of 42 years if desired; it would be a going concern, even though erected on the gas-works premises.

Mr. SEABROOK said that the gas-works plant, which made gas for supplying consumers in the town, would also make gas for the engines driving the electricity plant; and if the electric lighting plant were bought separately from the gas-works plant, then the Gas Company would have on their hands the plant which had been used for the electricity undertaking. Also, the local authority would have to go to extra expense in providing plant for driving the electricity generating plant.

Mr. SEDGWICK reminded the Committee that the local authority had considered the clause before the Bill was deposited, and had not petitioned. They had also seen the Bill after it had passed the first House, when a copy was sent to them, calling their attention to the amendments made; and a letter had been received from them stating that they had no observations to make.

The Committee then deliberated in private, and subsequently

The CHAIRMAN announced that the Committee were willing, in this rather exceptional case, to pass the Bill with this purchase clause, but considered that it should be indicated in some way in the preamble to the Bill that the clause was allowed because of the exceptional circumstances—Oakham being a small place, which could not carry on two large competing undertakings. It was not to be taken as a precedent where the situation was quite different.

Following a remark by Sir Ernest Moon that they had better not put the words in the preamble, and a suggestion by Mr. Sedgwick that they should be put into the recital at the beginning of the clause, it was decided to settle the form at the next meeting of the Committee.

Mr. W. S. CLARK (Chairman of the Company) proved the preamble.

SWANAGE GAS AND ELECTRICITY BILL.

This Bill was ordered to be reported for third reading by the Unopposed Committee of the House of Lords, presided over by the Earl of DONOUGHMORE (Chairman of Committees) on June 5. (The provisions of the Bill were set out in the "JOURNAL" for Feb. 14, p. 386.)

In the section dealing with the transfer of the undertaking of the Swanage Electricity Supply Company, Ltd., to the Swanage Gas Company, there are one or two amendments and new clauses. One new clause provides that if, at the expiration of three years from the transfer of the electricity undertaking to the Gas Company, suitable and sufficient distributing mains are not laid down in the extended area of supply (the parishes of Langton, Matravers, and Studland), the Minister of Transport may order that the powers as to the supply of electricity in these parishes shall cease. The clause regarding the method of charging for electricity, which provided that the Company might charge by any method selected by them and approved by the Minister of Transport, is struck out of the Bill.

As to the gas provisions, there is a new clause providing that if, after the expiration of five years from the passing of the Act, the Company have not laid mains for the supply of gas in Studland (which parish is added to the old area of supply), the local authority, or a company or person, may apply for power to provide a supply. With regard to the price of gas outside the urban district of Swanage, a new clause provides that the price to be charged may exceed that charged within the district by not more than 3d. per therm.

Protection clauses are included relating to the Swanage Urban District Council and the Dorset County Council.

The additional capital which it was proposed to raise has been reduced from £80,000 to £40,000; but, with the consent of the Electricity Commissioners, further capital may be created and issued for the purpose of the electricity undertaking.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 6.]

Nos. 13,968 to 14,584.

BERRY, J.—"Dry gas-meters." No. 14,567.
BREWSTER, J. W.—"Gas-cooker grease-guard." No. 14,352.
BREWSTER, M. M.—See Brewster, A. W. No. 14,352.
COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ.—"Recording gas-meter." No. 14,488.
DEMPSTER AND SONS, LTD.—"Lids or doors." No. 14,447.
FOWLER, R.—See Berry, J. No. 14,567.
HIGGS, H. C.—"Ovens of gas-stoves." No. 14,481.
JOHNSTON, A. G. KENT.—"Means for lighting gas-lamps." No. 14,193.
METERS, LTD.—See Berry, J. No. 14,567.
WAITE, A. H.—"Gas-cookers, &c." No. 14,526.
WAITE, C. G.—See Waite, A. H. No. 14,526.
WAITE, K. C.—See Waite, A. H. No. 14,526.

Reading Gas Company's Issue Over-Subscribed.—The recent issue by the Reading Gas Company of £10,000 of ordinary stock, to rank for a maximum dividend of 5 p.ct. per annum, was considerably over-subscribed; only partial allotments being made at the minimum price of 98½ p.ct.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

Abercarn Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 7s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8d. per therm.

Corsham Gas Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 17·95d. per therm.

Swadlincote District Urban District Council.

The maximum prices now authorized in respect of the supply of gas by the undertakers are 6s. 9d. per 1000 c.ft. within the district and 7s. 6d. outside; and the prices they have asked the Board of Trade to substitute for this are 1s. 4·89d. and 1s. 7·39d. per therm respectively. It is also proposed that an additional charge of 2·5d. per therm should be authorized in respect of gas supplied through a prepayment meter.

DECLARATION OF CALORIFIC POWER.

Lowestoft Water and Gas Company.—480 B.Th.U. (June 24).

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Bradford-on-Avon Gas Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 16d. and 17·4d. per therm; and these prices respectively shall be substituted for the prices of 4s. and 4s. 8d. per 1000 c.ft. mentioned in section 52 (dividends dependent on price charged) of the Bradford-on-Avon Gas Act, 1902. (June 5.)

Calverley and Horsforth District Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15d. per therm. (May 31.)

Titchfield District Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 17d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

Prepayment meter clauses are included. (May 31.)

Wadhurst and District Gas and Coke Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 19d., 19·6d., and 20·2d. per therm; and these prices respectively shall be substituted for the prices of 5s., 5s. 3d., and 5s. 6d. per 1000 c.ft. mentioned in sub-section (1) of section 41 (dividend dependent on price charged) of the Wadhurst and District Gas Act, 1914.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and one-half.

Prepayment meter clauses are included. (May 31.)

BARROW CORPORATION GAS UNDERTAKING.

At the Barrow Town Council meeting on Monday, June 4, Alderman A. BROWN (the Chairman of the Gas and Water Committee) reviewed the past year's working of the gas undertaking.

The net profit was £2430. There was a decrease of 20 p.ct. in the consumption compared with the previous twelve months, representing 71½ million c.ft. The price was reduced as from April 1, 1922, from 5s. 6d. to 4s. 9d. per 1000 c.ft.; and the receipts for the 279½ million c.ft. sold were less by £30,144 than in the previous year. There were 23,782 tons of coal carbonized, the average price of which was reduced by about 35 p.ct. as compared with the previous year. The total decrease in the receipts of the department was £37,700. On the other hand, savings had been effected in the working expenses amounting to £36,505; the chief item being for coal, where the decrease in cost amounted to £20,155. After providing the sum of £8395 for renewals of the works and plant, there was a net profit of £2430. During the ensuing year, the Committee will undertake the renewal of the vertical retorts at the Salthouse works. The present retorts have been in use since the works were opened in 1917.

The Council approved the Committee's minutes.

Calorific Value at Hull.—The British Gas Light Company, at Hull, have intimated to the Corporation that they have obtained an Order under the Gas Regulation Act, and that it is their intention to declare a calorific value of 460 B.Th.U. The Water and Gas Committee, to whose notice the matter was brought, had no observations to offer. The Company added that it was their intention, as soon as possible, to announce a reduction in the price of gas. The Engineer informed the Committee that the proposed calorific value was quite acceptable. That declared by the East Hull Gas Company, he said, was 450 B.Th.U.

THE SUGGESTED TAXATION OF MOTOR BENZOLE.

Statement by Mr. W. G. Adam on Behalf of the National Benzole Association.

Brief reference was made in last week's "JOURNAL" to the inquiry being held by the Departmental Committee of the Ministry of Transport on the Taxation and Regulation of Road Vehicles; and we are now in a position to give the evidence submitted on behalf of the National Benzole Association by Mr. W. G. Adam, B.A., Superintendent of the Tar and Ammonia Products Works of the Gas Light and Coke Company, and a Technical Member of the Council of the Association.

Mr. Adam said that in submitting his statement for, and on behalf of, the National Benzole Association—a body representing the producers of 85 p.ct. of the motor benzole output in this country—he had limited himself by the assumption that the suggestion under consideration was to vary the present method of taxation of mechanically-propelled road vehicles by the imposition of a flat-rate duty per gallon of hydrocarbon motor spirit. The memorandum concerning motor taxation, submitted to the Ministry of Transport on behalf of Associations representing the Motor Vehicle Owners and Motor Vehicle Industry, in its original form, specifically excluded home-produced motor fuel from taxation; but in the amended copy dated Feb. 24, 1923, it was suggested that a flat-rate duty be placed upon all motor spirit other than power alcohol. A definition of, and a specification for, motor spirit had been submitted which would cover, not only motor benzole, but also pure benzole, pure toluole, xylole in its commercial and pure forms, solvent naphtha, and many samples of heavy solvent used in the chemical and allied industries. It would also include several of the light fractions obtained on the distillation of coal tar, oil-gas tar, and blast-furnace tars. He proposed, therefore, to consider the position of home-produced motor spirit in the light of this suggested taxation—in particular, motor benzole and the hydrocarbons constituting motor benzole.

STATISTICS.

Benzole Production.

(National Benzole Association.)

1918	26,400,000	gallons.
1919	21,597,913	,,
1920	20,838,407	,,
1921	13,971,901	,,
1922	11,155,756	,,
1923 (estimated)	17,500,000	,,

Petrol Imported.

1919	148,000,000	gallons.
1920	181,000,000	,,
1921	238,700,000	,,
1922	340,000,000	,,
1923 (estimated)	420,000,000	,,

Potential Home Production of Benzole.

Coke-ovens	29,200,000	gallons.
Gas-works	17,000,000	,,

Number of Registered Tar-Works.

Great Britain—Alkali Inspector's Returns . 430

Number of Gas-Works.

1440.

In 1918 186 gas-works possessed oil washing plants.
600 ,, ,, tar ,, ,,

GENERAL POSITION.

Dealing with the general position, Mr. Adam said that, from an examination of the figures concerning the production and consumption of motor benzole and petrol, it would be seen that general agreement existed with the figure of 6 p.ct. which had already been placed before the Committee as representing the ratio of motor benzole and petrol consumed in a normal year. The production of benzole available as motor spirit during the year 1924 might be estimated as 20 million gallons, which, under a 4d. tax, would yield a gross revenue of £333,000, or £417,000 under a 5d. tax. To collect this tax, it would be necessary to impose excise regulations upon some 430 coke-oven installations and tar-distillation plants, and 1440 gas-works, as it must be remembered that every gas-works, even though it did not produce benzole under present conditions, was at least a potential benzole producer, and in many cases possessed the necessary gas washing and benzole rectifying plant. Although such a plant might not be in use at the present time, it would of necessity have to be subject to periodical inspection by excise officers.

It had been suggested to the Committee that one excise officer could supervise nine such operating stations; but the suggestion hardly seemed practicable, seeing that many of the coke-oven plants were some miles from the nearest railway station; and though the coal mining counties naturally contained more such works than the others, nevertheless these works were by no means in close proximity to each other. On the other hand, a gas-works existed in nearly every town containing 2000 inhabitants and upwards; and every one of such works would necessitate periodical excise inspection owing to its potentialities. It was stated that there were in this country 142 whiskey distilleries and 1482 breweries. To supervise these, the Government appointed about 1600 excise officers to collect a tax of £198,000,000. By comparison, was it seriously contended that 430 coke-oven and tar-distillation plants, and 1440 gas-works scattered all over the country, could be supervised by excise officers economically to collect £333,000? He was strongly of opinion that the revenue from such a tax would not be commensurate with the cost of collection.

He had next to consider the bearing of excise regulations upon the works operations at the producing stations. These stations varied in capacity over very wide limits; but in all cases they worked with a comparatively small storage ratio—indeed, some of the smaller works held only day-to-day stocks. Under excise conditions, it would be necessary

to provide greatly increased storage, unless the Government would be prepared to accept the producer's unchecked figures, which was most unlikely. Further difficulties might arise owing to the fact that varying amounts of finished motor benzole might be drawn back into a plant for re-distillation, to obtain pure benzole and toluole, as the exigencies of the chemical industry might demand.

Again, of the total production of benzole and of its homologues suitable for use as motor spirit, at least 20 p.ct. was employed in the manufacture of aniline dyes and of blasting and high explosives, as a solvent in various branches of the chemical and allied industries, in the manufacture of synthetic perfumes and fine chemicals, and for other general industrial purposes. Hence, were a tax placed on benzole, a complicated system of licences or rebates would have to be instituted, and the whole of the chemical and allied works of this country would have to be brought under close excise control and inspection. Further, special supervision would have to be exercised over plants where benzole was used as a raw material and was partially recovered during the process of distillation. The recovered benzole, naturally, could be used for fuel purposes. The restrictions on the use of industrial alcohol in this country had been closer than in Germany or the United States of America; and the home chemical industry had been at a serious disadvantage as compared with its foreign competitors. The cost of supervising the use of duty-free spirit must be deducted from the anticipated revenue; and the total effect of these regulations would, in his opinion, be to discourage rather than to encourage an increased output of home-produced spirit.

Necessity for a Home Supply of Motor Spirit.

For many years past, Mr. Adam went on to say, the policy of encouraging an increase in home-produced motor spirit had enjoyed the commendation of the community. This policy had had the support, not only of Government Departmental Committees, but also of associations representing motor owners and every branch of the motor vehicle industry, and of scientific bodies throughout the country. The necessity for a home supply of motor spirit arose from more than one consideration. It was of supreme importance that this country, being an island, should have a supply of home-produced spirit at least equal in quantity to any emergency demand that essential transport purposes might require; and motor benzole was the only home-produced fuel upon which they could at present rely. There was also the fact that they must be able to maintain ample supplies of benzole, toluole, and xylole for the manufacture of explosives and gases for warfare purposes, should they be required; and seeing that such products probably would be needed without much warning, it would be a short-sighted policy to reduce the effective capacity of existing plant.

Further, the industry, to maintain itself, must keep pace with research and present encouragement for investigations with a view to obtaining improved methods or devising fresh sources of supply. There was still a large field available for research, particularly in the practice of gas washing. It has been suggested that a great future existed for the use of Empire-produced alcohol as motor fuel; but from the scientific papers so far published, it would appear that the optimum conditions for its employment would be arrived at by admixing it with benzole or petrol, or more probably by utilizing the three components, inasmuch as benzole was valuable in widening the range over which alcohol containing small percentages of water might be mixed with petrol.

Under present-day conditions, there was little encouragement for a gas-works to become a benzole producer. As prices now ranged, the process of gas washing had to be carried out under exceptionally favourable circumstances in order that it could be made to yield a profit. In the case of the Gas Light and Coke Company, several gas-washing plants had recently been closed-down, for the reason that the margin of profit between the value of benzole as a constituent of town gas and its value as a refined motor benzole, after deducting working costs, was negligible. At times the balance had been on the wrong side. The future production of benzole at the coke-ovens depended to a large extent, as had been suggested by previous witnesses, upon the prosperity of the iron and steel industries. On the other hand, benzole produced from gas-works, which during the war reached a figure of over 5 million gallons, was entirely a matter of the relation between the value of benzole as a constituent of gas and its value as a raw material for the production of refined motor spirits. The total production of benzole in 1918 was 26,400,000 gallons.

Admittedly, the benzole producers were claiming preferential treatment as compared with the petrol producers; but, on closer analysis, it was evident that, whereas in the case of the latter the disabilities contingent on increased storage capacity, the holding-up of stocks, and the outlay on plant were confined to some 24 large stations, in the case of the benzole producers these disabilities would be distributed at a much greater cost per unit over some 1870 potential works (360 producers to-day), and would be a serious handicap upon the industry. To Mr. Adam's mind, it seemed that, in return for diminishing the universal application of the principle that taxation should be proportional to road use and for the grant of this slight preferential treatment, which, if all things were taken into account, would not diminish revenue, the country was obtaining an improvement in fuel supplies and security in time of need.

Extension of the Greenbank Gas-Works.—The Blackburn Town Council, on June 7, approved an expenditure of £30,000 for increasing the carbonizing plant at the Greenbank Gas-Works, by the extension of the vertical retorts and the installation of waste-heat boilers. A loan is to be applied for.

Leeds Gas Undertaking.—The Leeds City Treasurer has submitted to the Gas Committee a statement of accounts of the gas undertaking for the year ended March 31, subject to audit; a surplus profit of £53,143, which reduces the deficit of £78,834 at March 31, 1922, to £25,691, being recorded. The Committee placed on record their appreciation of the services of the Engineer and General Manager (Mr. C. S. Shapley) and the staff in the successful working of the undertaking during the past year.

BIRMINGHAM GAS DEPARTMENT.

Annual Report.

The annual report of the Birmingham Corporation Gas Committee, of which Alderman J. H. Lloyd is Chairman, was presented yesterday week to the City Council.

The Committee state that they have for some time considered the possibility of a further reduction in the price of gas. The position as regards coal prices, which have such an important bearing upon costs of production, is very uncertain; and there is risk in reducing prices before it is known what coal is likely to cost the department after the termination of the present contract period. In view, however, of the reduced cost of production at the works, economies effected in other directions, and the desirability of still further encouraging the use of gas, the Committee came to the conclusion that a reduction of 3d. per 1000 c.ft. could be made after the March readings of the meters.

It was not possible to report to the Council before the commencement of the period in which the same would take effect, and the Committee therefore decided to anticipate their approval. In taking this course, the Committee were influenced by the difficulties and expense of ante-dating alterations of price as regards prepayment consumers. Many thousands of these consumers would, before the sanction of the Council could have been obtained, have paid for their gas at the higher rate; and in each case a refund would have had to be calculated and returned to the consumer—a laborious proceeding.

The 3d. does not apply to every section of consumption on the scale; the Committee having borne in mind the promise made to the Council in their report on May 30, 1922, that, as soon as possible, efforts should be made to reduce the difference between the lowest and the highest prices charged. In preparing the scale, the Committee had regard to the percentage increases in each class above the Midsummer, 1915, scale of prices, so that no consumer has a less percentage advance than the small user.

The reconstruction of the Mond plant (damaged by the explosion at the Saltley works) has been placed in the hands of the makers; and it has been agreed that the dry collecting main shall be abolished. This will be replaced by a combined hydraulic gas-collecting main and mechanical dust washer, which will practically obviate any further trouble in cleaning out dust. This will be brought down into the wash boxes and removed daily. The modified plant will enable five superheaters, which formed part of the original plant, to be discarded.

Reconstruction of Carbonizing Plant at Nechells Works.

Twelve months ago the Committee referred to the progress made with the new carbonizing plant at the Nechells works. Notwithstanding trade disputes, satisfactory progress was made by the contractors; and the first range of the new vertical retorts was put into operation at the beginning of December last. A further range was completed and brought into use for gas making at the end of the same month; and it is anticipated that the entire plant will be completed about July next.

South Staffordshire Mond Gas Bill.

The Bill recently promoted by the South Staffordshire Mond Gas Company has been under consideration by the Committee. Under their former Acts, the Company were prohibited from supplying their gas for purposes of illumination or for use in private dwelling-houses. It was originally proposed in the new Bill to repeal some of the restrictions placed upon the Company, which would have allowed them to supply gas to customers for illuminating purposes in parts of South Staffordshire within the area of supply of the Corporation. As a result of negotiations with the promoters, it was mutually agreed the Company should not ask for the repeal of the restrictions prohibiting the supply of Mond gas for purposes of illumination or for use in private dwellings, except by way of supply in bulk, and that the Bill should be so amended as to protect the interests of the Corporation. The Committee were advised that, in view of the amendments agreed upon, it would not be necessary to petition against the Bill.

Loans.

In July last, the Ministry of Health sanctioned the borrowing of £401,655 for the construction of two holders, tanks, &c., at the Washwood Heath works, and the laying of a new trunk main from Aston Church Road to Sutton Road. Of the sum mentioned, £389,555 has to be repaid within thirty years, and £12,100 within twenty years; the latter sum being in respect of the reinforced concrete culvert for diverting the stream which formerly ran through the centre of the works site. The construction of the culvert has been completed, and the stream diverted along the boundary of the department's land to a point where it discharges into the Rea, some distance higher up the river than formerly.

The contract for the construction of the tanks for the two holders has been placed with Messrs. Harrold Arnold & Son, Ltd., of Doncaster, whose tender amounted to £69,392. The design of the tanks has been approved by the Ministry of Health, and the work is now being executed by the contractors.

Invitations to tender for the construction of the first section of the holders have been issued, and will be dealt with in due course.

The laying of the trunk main between Aston Church Road and Sutton Road is practically completed; and the main will be available for improving the supply of gas to Sutton Coldfield next winter.

The Accounts.

The statement of accounts for the year ended March 31 last shows a surplus of £52,418, which has been carried to the special maintenance account.

The restrictions imposed by the Order relating to the Birmingham gas undertaking, made under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, prevent the surplus on the year's working being applied to the relief of the rates.

STATISTICS.

The following are comparative statistics for the years ended March 31, 1922 and 1923.

—	1922.	1923.	Inc.	Dec.
Gas sold during the year (c.ft.) . . .	10,264,218,300	10,937,923,300	673,705,000 = 6½ p.ct.	—
New services laid during the year .	2,592	2,795	203	—
Cooking and heating stoves sold during the year	1,901	2,235	334	—
Total number of cooking and heating stoves on hire at March 31 . . .	71,700	74,001	2,301	—
Total number of cookers supplied by P.P. Meters at March 31 . . .	99,478	100,569	1,091	—
Total number of P.P. meters fixed or on consumers' premises at March 31 .	103,363	104,737	1,374	—

The Chairman's Statement.

Alderman J. H. LLOYD, presenting the report, referred to the fact that the Committee had been able to make a slight reduction in price, to the amount of 3d. per 1000 c.ft. This represented in a full year approximately £120,000. The price had now come down from the highest level of 5s. 6d. to the lowest level of 3s. 6d., a reduction of 35 p.ct. The Committee were hoping to be able to make a further reduction before long; but the coal situation was such an extremely difficult one that it was impossible at the moment to see any substantial reduction in the near future. Increased prices were being asked for all classes of coal; and the situation was a very serious one, not only for gas manufacturers, but for all the industries of the country. Owing principally to the Ruhr occupation, the export prices of coal had advanced by leaps and bounds; and this had a consequent tightening effect upon the home market. Mainly by economies effected in cost of production, the Committee were satisfied that the 3d. per 1000 c.ft. given from the March reading of the meters could be maintained, and were hopeful that conditions might alter in their favour in the course of the next twelve months and enable them still further to bring down the price of gas. Dealing with the accounts, he remarked that rates and taxes showed a slight decrease; but this item—*plus* the cost of health and unemployment insurance—was equivalent to 5d. per 1000 c.ft. of gas sold, and represented an increase over 1914 of 3½d. per 1000 c.ft. Wages cost was also much higher than pre-war, being 9d. per 1000 c.ft. as against 4⅝d. in 1914; while the increased cost of coal and oil represented an increase of 6·4d. per 1000 c.ft. to-day as compared with 1914. These items alone totalled an increase of 1s. 2d. per 1000 c.ft. of gas sold. Although the net profit for the past year amounted to £52,000, this fact was taken into consideration when the Committee decided to make a reduction as from the March reading of the meters.

Mr. HARRISON BARROW asked how much represented income-tax. He presumed that efforts were still being made to get the tax reduced, because if the Council's transactions were taken as a whole they did not make any profit, and therefore should not be charged any income-tax.

Alderman LLOYD replied that the amount of income-tax charged to the Gas Department was between £70,000 and £80,000 a year.

BLACKBURN CORPORATION GAS UNDERTAKING.

Annual Report.

In his third annual report to the Gas Committee of the County Borough of Blackburn, Mr. G. P. Mitchell, the Engineer and General Manager, states that the quantity of gas made in the twelve months ended March 31 was 910,382,000 c.ft., which is an increase of 3·72 p.ct. over the previous year.

The total wages paid amounted to £42,444, equal to 11·9d. per 1000 c.ft. of gas sold, and an average weekly wage of £3 10s. 5d. per workman. The work of replacing inadequate mains and services was continued throughout the year, at a cost of £10,370. During the past four years the expenditure in this direction has amounted to £62,076 (equal to a charge on the total gas sold of 4·65d. per 1000 c.ft.). Consequently more satisfaction having been derived by consumers, complaints have become less in number, and the revenue, together with the consumption of gas, has increased thereby.

The result of the year's working is a net surplus of £16,596. The expenditure exhibits a decrease of £48,710, due primarily to the reduced cost of coal and to improved working results. During the year, 48,413 tons of coal were carbonized, as compared with 50,603 tons in the preceding year; the reduction of 2190 tons having been brought about by improved working of the vertical retorts, which have yielded an average make of 18,736 c.ft. of gas per ton, as against 15,487 c.ft. the year before, which was the previous highest make recorded. The amount realized on residuals exceeded expectations. An increased make of tar and sulphate of ammonia on a better market resulted in obtaining £9090 more.

An additional steam-turbine exhauster has been installed at the Addison Street works for the purpose of drawing the gas from Greenbank, which is the only alternative until a favourable opportunity occurs for the provision of an additional gasholder. By the installation of a new set of condensers and an additional rotary scrubber, the wet purification plant is now capable of dealing efficiently with the increased make of gas. A "Columbus" coke separator has been erected for the purpose of salvaging coke from the pan ash of the producers, hitherto carted to the ash-tip. From tests which have been made, not less than 40 p.ct. of coke suitable for use on the works has been recovered, thus making an equivalent quantity of fresh coke available for sale.

In view of the abnormal trade conditions during the past four years, it is, says Mr. Mitchell, highly satisfactory to note that the annual make of gas has increased from 734 to 910 million c.ft., which is equivalent to 24 p.ct.

Referring to the report, the local "Times" says: In 1919 the price of gas was increased to 4s. 10d. per 1000 c.ft.; and, although the price of coal advanced by more than 14s. per ton up to 1922, the price of gas was maintained at the same rate. A reduction of 6d. per 1000 c.ft. was made in March, 1922, and a further reduction of 4d. from the last quarterly reading. The Chairman, Committee, and the Engineer are to be congratulated on the financial result—the profit being the highest ever recorded by the department—which is no doubt due to a vigorous policy in improving mains and services.

MALTA AND MEDITERRANEAN GAS COMPANY, LTD.

The Ordinary General Meeting of the Company was held on Tuesday of last week, at the London Offices, Nos. 59 and 60, Gracechurch Street, E.C.—Mr. A. F. PHILLIPS (the Chairman) presiding.

The SECRETARY (Mr. C. J. Daun) read the notice convening the meeting and the Auditors' certificate; and the Directors' report and the statement of accounts were taken as read.

AN INCREASED SALE OF GAS.

The CHAIRMAN, in moving the adoption of the report and accounts, said that when he last had the pleasure of addressing the proprietors, he was able to report that the Company were free of the incubus of the two Sicilian stations, which had given so much trouble and anxiety since the outbreak of the war. They could obtain no consideration from the Authorities, and were compelled to keep them going at a great loss. With the assistance of an able Advocate who had given them advice in other business, the Board were at last able to close those trying negotiations, get rid of the two works, and avoid further loss. It was a great relief to all the Directors. During the past years, the Company had aimed at the development of the business at Malta, and had been successful. They supplied there a population who appreciated the gas; and they received proper consideration from the Authorities. The great loss in exchange they had had to contend with in Italy did not affect Malta—an English Colony. The sale of gas last year had increased by 2¾ p.ct., which was satisfactory, considering that the number of Government officials was less than during the war. The great help in improving the financial position had been the price of coal. While in 1921 it had cost over 90s. per ton, last year some of it had been obtained at about 41s. Unfortunately, both coal and freights had gone up again considerably; but the Directors looked forward to a reduction when the position on the Continent improved. The gas rental was £40,863, against £53,812 in the previous year. This considerable reduction in the revenue with an increased sale of gas of 2¾ p.ct., might appear extraordinary, and was due to the great reduction in the price of gas the Company had been able to make with cheaper coal. He would remind them that in 1921 gas was 13s. 8d. per 1000 c.ft., which was reduced to 10s. in March, 1922, to 9s. in June, and further to 8s. 6d. to the close of the financial year. Since then another reduction had been made to 7s. 10d. per 1000 c.ft. The cost of coal had been the great difficulty with which the Company had had to contend. Previous to the war, the coal was delivered into the Malta stores at 23s. per ton. The cost continued to increase up to 1921, when it was £8 9s. per ton. Since then it had fallen rapidly, and the cost last year was about 42s. per ton. The receipts for coke had, of course, fallen in proportion, and last year were £5190, against £8195 in the previous twelve months. During the year the works and mains had been well maintained. An additional Lancashire boiler and a Livesey washer had been added; and the tar dehydration plant had been reconstructed. The balance of revenue account was £15,924, from which £4000 had been transferred to the reserve account. The balance was carried to profit and loss, which, after meeting the interim dividend, stood at £11,820. After payment of the dividends recommended, £7468 would be left to be carried forward to the credit of next year's account.

Mr. A. M. PADDON formally seconded the motion, which was at once unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. W. OKE, it was resolved that a dividend of 3½ p.ct. (making with the interim dividend paid in December last 6 p.ct. for the year), free of income-tax, be declared on the ordinary shares; and that dividends of 3½ p.ct. and 3¾ p.ct., less income-tax, be declared on the first and second preference shares respectively.

The CHAIRMAN, proposing the re-election of Mr. Strachan C. Clarke as a Director, said this gentleman's services on the Board were most highly appreciated. He possessed very considerable knowledge of Eastern affairs, with which Malta, of course, was in touch, and at all times was able to give valuable advice and assistance.

Mr. FRANK H. JONES seconded the resolution, which was agreed to, and acknowledged by Mr. CLARKE.

The Auditors (Messrs. Ernest L. Burton and William Cash) were also re-appointed, on the motion of Mr. F. W. CHURCH, seconded by Mr. ROBERT WILSON.

DIRECTORS' SERVICES ACKNOWLEDGED.

Mr. A. D. DODGSON moved that the sum of £500 be paid to the Directors as additional remuneration, to be divided among them as they might agree, and that it be paid free of income-tax. He said this resolution was moved, seconded, and agreed to at the meeting a year ago; but it could not at that time be given effect owing to lack of notice. His father had proposed it on that occasion, and

had asked him to say how sorry he was not to be able to attend the meeting that day so as to move the resolution again. The suggestion did not need any further recommendation from him (the speaker); but if anything had been needed to commend it to the shareholders, it would have been only necessary to compare the balance-sheet of three years ago with that for last year, in which they found that the whole of the preference capital was covered by gilt-edged investments.

Mr. R. S. CLARKE seconded the proposal.

Mr. R. D. DORMOR remarked that last year, when the proposal was first put forward, he addressed a letter to the Chairman rather protesting against it, as it seemed to him that they ought to build up the amortizement and reserve accounts somewhat before beginning to be lavish; but since then he had taken an opportunity of chatting with several people who knew Mr. Phillips in particular. He had great respect for Mr. Phillips, and knew what he had done for the Company; and after weighing up the matter, and noting the great improvement in the balance-sheet on this occasion, he would like to support the proposition, rather than offer any objection to it. He therefore withdrew anything he had previously had to say against it.

The resolution having been unanimously agreed to,

The CHAIRMAN said he could assure the shareholders that the Directors much appreciated this mark of their confidence. It was not the value of the money so much as the satisfaction they felt at the undertaking being more successful. They had now only one station at Malta. This was going on very steadily; and the results from it were all they could desire. He was thankful to say they had no more Trapanis and no more Marsalas. They were a great loss to the Company, and kept the shareholders out of their dividend for two or three years.

Mr. DORMOR: What is the length of the lease of the Malta works?

Mr. PADDON: It has about another 29 years to run. Of course, a great deal can be done in that time.

VOTES OF THANKS.

The CHAIRMAN said that now the shareholders had very kindly expressed their appreciation of the services of the Directors, he would like them to join the Board in voicing their approval of the manner in which the staff, both in London and Malta, had discharged their duties during the past year.

Mr. PADDON remarked that he had great pleasure in seconding this, because he had just looked through the last return of the working at Malta, and, speaking with some knowledge of works' practice, he could tell them that it was on as high a level as any in this country. It was a super-excellent piece of work, considering all the circumstances. Mr. Wilson in the days gone by had constructed the carbonizing plant there and operated it afterwards; and he would be pleased to know that the Engineer who was there now was working closely to his standard. The officers deserved whatever they might accord them in the way of recognition. As to the extra remuneration that had been voted to the Directors, he would, on behalf of his colleagues, like the shareholders to realize the excellent work which had been done by Mr. Phillips in emancipating the undertaking from its difficulties. The shareholders had no idea how nearly on the rocks the concern had been at one time. It was only continuous hard work, that no other man than the Chairman could have done, which had saved the Company. He did not know how they could have got out of the difficulties in connection with the Italian stations if it had not been for the fifty years' experience that Mr. Phillips had had of the Italian Courts and their ways. Mr. Phillips it was who found the Advocate he had referred to in his speech. He trained that Advocate for years to litigation in Italy, brought him forward at the right time, and got the Company out of the mess. Without this explanation, the proprietors would never have understood two things—how near their undertaking was to being wrecked, and how much they owed to Mr. Phillips for extricating it from the difficulty.

The CHAIRMAN said he thought Mr. Paddon, in his warmness of heart, had ascribed too much to him. He certainly did his best, as it was his duty to do. It was difficult to realize the trouble they had had with these two little Italian stations.

The vote was cordially passed.

Mr. DAUN remarked that he had hoped Mr. Buckley would have been present to respond personally; but unfortunately he had not yet arrived in this country.

Mr. F. R. SMITH said they had already shown their satisfaction with the Board; but he would further like to say how extremely thankful they were to the Directors for having given them so excellent a balance-sheet. It was not necessary to propose a formal vote.

Macclesfield Gas-Works.—From Mr. Francis W. J. Belton, Engineer and Manager of the Macclesfield Gas-Works, we have received the gas-works account for the year ended March 31. This shows a gross profit of £13,941 for the year, as compared with a loss of £10,220 on the previous year's working. The Gas Committee have revised the prices of gas. The maximum price charged to ordinary consumers is 10·5d. per therm, and to prepayment consumers 12·1d. These maximum prices are lowered on a sliding-scale basis of consumption. The maximum price for power purposes is 10·47d. per therm; and if the consumption be greater than 200 therms per annum, the price is 5·75d. per therm.

Improved Results at Skegness.—Improved financial results in relation to the Skegness gas undertaking, which is under the control of the Urban Council, were reported at a recent meeting, when a balance-sheet was presented which showed that for the financial year ended March 31 last, the gross profit was £2984, compared with £2111 for the previous annual period. The Manager (Mr. F. Young) reported that during the past month the amount of gas made showed an increase of 31 p.ct. over that of the corresponding month of last year. Mr. S. Moody criticized the multiplicity of the demands of the new Manager in regard to additional instruments, &c., for the works. The Chairman (Dr. Sweeten) pointed out that when the Council took over the plant it was in a very dilapidated condition.

WORKINGTON GAS-WORKS RESULTS.

Mr. Hedley Hoy (the Engineer and Manager), in his report to the Workington Corporation Gas Committee for the year ended March 31, says that the gas produced per ton of coal carbonized shows a further increase of 19,919 c.ft., or 87·6 therms; the gas sold per ton being 18,142 c.ft., or 79·8 therms. Both figures are a record for the department, and he believes they have not been exceeded by any other undertaking. The average calorific value of the gas supplied during the year was 440 B.Th.U. The vertical-retort plant has worked satisfactorily during the year. The quantity of residuals produced shows an all-round improvement, especially in the case of tar and sulphate of ammonia. The net return from residuals was 55 74 p.ct. of the cost of coal, against 42·64 p.ct. for the preceding year. Gas used by ordinary meters shows a substantial increase; while in the case of prepayment meters a decrease is recorded, due to unemployment. Of the total gas distributed, 51·50 p.ct. was supplied through ordinary meters, and 33·34 p.ct. through prepayment meters. The average price received per 1000 c.ft. of gas sold was 3s. 8·17d., equivalent to 10d. per therm. The total make of gas was 162,104,000 c.ft., as against 151,630,000 c.ft. in the previous year, equal to an increase of 6·9 p.ct.

The report of the Borough Treasurer (Mr. T. Armstrong) states that the gross profit this year is £6537, against £6192 in the preceding year, being an increase of £345, and the highest in the history of the undertaking. The net profit is £828, against £1129—a decrease of £301.

Alderman Hall, in presenting the report to the Council, remarked that a year ago he asked Mr. Hoy to give them 20,000 c.ft. of gas, without reducing the quality, and an equal return for residuals. The department had produced from each ton of coal 19,919 c.ft. of 400 B.Th.U. gas, 11·87 cwts. of coke, 16·03 gallons of tar, and 20·72 lbs. of sulphate of ammonia. If they converted these figures into weights, and added 5 p.ct. additional weight through steaming the charges in the retorts and the weight of acid taken up in the sulphate process, they would find for every ton of coal used a ton of products. If they took the increased yield of 743 c.ft. of gas, there was a saving of 304 tons of coal; and adding to the value of this the increased yield of coke, tar, and sulphate of ammonia, it would be found that the whole of the Engineer's salary had been met. Every section of the department was alive and growing; and more and more they were reaping the benefit of the showrooms and distribution staff, by getting the public to understand the advantages of gas. He had never presented the accounts with greater pleasure, knowing, as he did, the good work of the Engineer, staff, and employees.

The Committee unanimously recommended that, as from the June quarter indexing, the price of gas be reduced as follows: Through ordinary meters, from 3s. 6d. to 3s. 2d. per 1000 c.ft. (inside the borough); through prepayment meters, from 4s. to 3s. 7½d. (inside the borough), or 23 c.ft. per 1d.; and for power, for the first 100,000 c.ft. per quarter, from 3s. to 2s. 8d., and any quantity in excess of the 100,000 c.ft. per quarter to be further reduced from 2s. 9d. to 2s. 5d. per 1000 c.ft.

TRADE NOTES.

More Woodall-Duckham Verticals for Aberdeen.

The Aberdeen Gas Department have just placed an order for a second installation of vertical retorts with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd. The installation will consist of a bench of six settings, each containing four of the Company's large-sized retorts, giving a total carbonizing capacity of 192 tons per day.

Practical Welfare at Stanton.

From the Stanton Iron Works Company, Ltd., near Nottingham, comes a booklet bearing the above title, and comprising an interesting selection of excellent photographs relating to this particular subject and to the work of the Company in general. With the booklet is a reprint from the "Iron and Coal Trades Review" of an article descriptive of all that the Company have done to secure practical and commercial welfare in connection with the undertaking and their employees. In this the writer says: "To evolve a system of welfare on practical and commercial lines which can be generally applied to coal and ironstone mines, ironworks, foundries, and engineering shops, is far from a simple proposition. Notwithstanding the existence of these conditions, however, and despite the initial difficulties, it is doubtful if there are works of a similar nature in the kingdom where the welfare system has been developed to a greater extent or upon broader lines than at those of the Stanton Iron-Works Company. The first real step in the welfare movement took place on April 29, 1919, when, at the instigation and under the direct supervision of Mr. E. J. Fox (Managing Director of the Stanton Company), a Works Committee were brought into being; and ever since, once a month, this Committee have met the management of the Company. It is significant that, following the initiation of this Committee, five further Committees, embracing the other outlying establishments of the Company, have been brought into being at the request of the men themselves."

The Turbine Furnace Company, Ltd.

The Turbine Furnace Company's list of orders for the month of May is the longest in the records of the Company. During the month, orders have been placed for the supply of turbine patent furnaces, with long durance firebars, by the Halifax Corporation Gas Department, the Kidderminster Gas Company, the Wolverhampton Gas Company, the Accrington District Gas and Water Board, and the Burgh of Galashiels. This is interesting at a time when many commercial undertakings are complaining of want of business.

Cheaper Gas at Thorne.—The Thorne Gas Company have notified consumers that the price of gas will be reduced from 7s. to 6s. 6d. per 1000 c.ft. on July 1.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

The week opened with every prospect of a continuance of the weakness which was felt at the end of May, and, indeed, during nearly all the month. The beginning of the week brought news of a settlement of the Belgian railway trouble, but with little prospect of supplies being handled to any large extent for a week or two. At the same time, there were rumours of impending trouble in the Belgian mines, which would, of course, help this market if they developed. But new inquiry of any kind was distinctly scarce. It was reported that certain tenders which had been submitted to Scandinavia had been put in at very bad figures by speculators. And, though collieries were nominally well sold for the month, in many cases they were beginning to be anxious as to whether the merchants who had bought could place the coal and stem the tonnage.

Towards the end of the week, however, while Northumberland steams remained weak, a change came over the Durham market, which ended in a much steadier tone. A good deal of inquiry began to come on again, both for gas and for coking coal; and there was a general feeling that the drop had been checked. Fresh inquiry was chiefly on German account; but a notable feature was the placing of two large cargoes for Australia for this month's shipment. Labour troubles were given as the reason; and there is said to be a prospect of more business in this direction, which would undoubtedly give the market a further fillip.

At the end of the week Wear, Specials and best quality gas (Holmside, Boldon class) were quoted fairly steady at 30s. to 31s.; and fitters were talking of an early return to 32s. 6d., with 35s. for coking. Second-class gas were 29s. to 30s. Collieries still retain much of their optimism for the second half of the year, and, consequently, no great volume of business is passing.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

Negotiations with regard to the new contracts for gas coal are now approaching the decisive stage. Comparatively few important undertakings in this district have finally fixed up their arrangements with the collieries; but they have all been getting to close quarters during the past week. Generally speaking, a conciliatory disposition is shown on both sides. With strong pressure for cheaper gas, engineers who have succeeded in turning the corner and are showing more satisfactory balance-sheets, are naturally disappointed that the continued stringency should have destroyed their hopes of further economies in production costs so far as the price of coal is concerned. What the extent of the ultimate readjustment will be is still a matter of doubt; but that contracts cannot be renewed on the old basis is generally recognized. With a few minor exceptions, it is not in contemplation to arrange for less than the full twelve months' supplies; the right of quarterly revision being reserved in many cases. There have again been complaints of excessive absenteeism at some of the Midland pits. Save in regard to high-grade household coals, the output is steadily taken up, though the inquiry for future supplies is not quite so insistent. Prices of slack, beans, and D.S. nuts are very firm, with a slight upward tendency in some instances. There is not much actual change in coke; but the feeling is rather easier.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

There is a lull in the export section of the coal trade in Yorkshire and Lancashire, possibly accounted for by the nearer Continental labour strikes, which are now at an end. Shipping prices have, therefore, declined; best South Yorkshire hards being quoted at 29s. f.o.b. Hull. Other prices have not receded to the same extent, and there is a feeling that in the course of a week or two the market will harden. There does not appear to be any improvement in the demand from industrial centres, although collieries are not insisting on the slightly advanced prices which have hitherto been operating.

Gas undertakings will probably be asked for an advance of 2s. per ton in future contracts; and it is thought that in many cases this will be paid, owing to the low figures which have previously operated. The appearance of more summer like weather is causing the house-coal trade to be on the decline; but any surplus thus created is being distributed in the shipping centres.

Lancashire house coal is still quoted at 33s. per ton, and second qualities at 26s. to 28s.

Reduction at Cowdenbeath.—A reduction in price of 5d. per 1000 c.ft. to all consumers, to take effect from the last reading of the meters, is announced by the Cowdenbeath Gas Company. The Directors hope to be in a position to intimate a further reduction in the course of a few months.

Wirksworth Gas Prices Reduced.—The Wirksworth (Derbyshire) Gas Light and Coke Company, Ltd., have decided to reduce the price of gas from 7s. 6d. to 6s. 10½d. per 1000 c.ft. for private purposes, and 6s. 3d. per 1000 c.ft. for power. In 1914 the price was 4s. 5d. per 1000 c.ft. for ordinary purposes.

Results at Burnley.—At the Burnley Town Council on Wednesday, Alderman Grey, the Chairman of the Finance Committee, complimented the management of the Gas Department on the past year's good results, which were largely brought about by the higher price for residuals in the last quarter and a greater gas consumption than estimated. The Department anticipated they would have a balance of profit of £18,600 to place to the reserve fund, after placing £3000 to the reserve fund for renewals of lamps, meters, stoves, &c. The increase over last year was £7000; the total profits being nearly £29,000. Alderman Grey hinted that next year he might make a call on the profits for the relief of rates.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 11.

The London Market for tar products continues without material change. There is considerable inquiry for pitch, for next season's shipment; but buyers' ideas at the moment are considerably below those of sellers, consequently little business is possible. Creosote is a steady market at about 10d. to 10¼d. per gallon. Pure benzole is about 1s. 9d. per gallon; 95-160 solvent naphtha is quiet at about 2s. per gallon; and pure toluole is from 2s. to 2s. 3d. per gallon. Pyridine is in brisk demand, and prices have gone up to about 15s. to 17s. 6d. per gallon. Other products are without change.

Tar Products in the Provinces.

June 11.

There has been little of interest during the past week. Pitch is still very quiet indeed, and buyers are holding off the market almost entirely. A little business has been reported in South Wales at low figures; but probably there were special circumstances in connection with the sale. Creosote is steady, but with little business passing. Benzoles are fully taken up for motor purposes. Solvent naphtha is easy, with little desire to sell on the part of manufacturers. Carbolic is still firm, and crystals are fetching big prices. Cresylic acid is steady.

The average values for gas-works products during last week were: Gas-works coal tar, 69s. to 74s. Pitch, East Coast, 115s. to 120s. f.o.b. West Coast—Manchester, 112s. 6d. to 117s. 6d.; Liverpool, 113s. 6d. to 118s. 6d.; Clyde, 116s. to 121s. Benzole 90 p.ct., North, 1s. 6d. to 1s. 6½d.; crude 65 p.ct. at 120° C., 1s. to 1s. 0½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 6d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 7¾d. to 8¼d.; salty, 7¼d. to 7¾d; Scotland, 6¾d. to 7¼d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 3s. 5d. to 3s. 6d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Price of Gas at Burnley.

Reporting to the Burnley Corporation Gas Committee, Mr. John P. Leather (the Gas Manager) says: In presenting my estimates for the current year in February last, I suggested that the price of gas should be reduced at the end of the June quarter. My estimates were based on the assumption that such reduction should be at the rate of ¼d. per therm. In doing so, I adopted conservative figures, anticipating that the value of residuals would soon diminish. On the contrary, we are now receiving more for residuals than at that time. In addition to this, I adopted a very low figure for sales of gas. The consumption is now increasing, and will probably increase yet more when the price of gas is reduced. I have therefore carefully re-calculated my estimates on the basis of 5 p.ct. increase in the make of gas, and find that, even if the price is reduced 1d. per therm, the surplus at the end of the year will probably considerably exceed £10,000, instead of £6180 shown in my former estimates. I strongly recommend the Committee, therefore, to adopt, as from the end of the current quarter, a scale of charges which will make the price of gas to ordinary consumers within the borough 8½d. per therm (3s. 4·375d. per 1000), instead of 9½d. per therm (3s. 9·125d. per 1000) as at present.

Walsall Make Nearly £19,000 Profit.

The annual report of the gas undertaking presented to the Walsall Town Council last week showed that following a loss of £3177 in the previous year, this year's profit of nearly £19,000 was all the more satisfactory. The Committee attribute the results to the united labour of the Engineer and his staff and themselves. The income under all headings, except the minor one of rents, showed a falling-off. The sale of gas brought in £122,028 last year, as compared with £128,129 in the previous twelve months; gas fittings and stove rentals £6648 as against £7619; wagon earnings £336, compared with £1009; and residual products £43,113, as against £44,035; while rents have risen from £487 to £506. On the other hand, the cost of manufacturing is returned as £86,947, as against £116,311 in the previous year; distribution costs £24,045, compared with £26,867; and management expenses amounted to £6567, as against £8494 After other expenditure has been allowed for, the gross surplus is £42,065, which dividends on stocks, contributions to sinking funds, &c., reduce to the net amount of £18,918. Recalling that during the year the price of gas had been reduced from 4s. 9d. to 4s. per 1000 c.ft., the Committee state that they are anxious still further to lower the charge as soon as they deem it safe to do so; and they promise that the matter will be again considered at an early date. While markets are still uncertain, the Committee express their belief that adverse conditions affecting the undertaking have to a considerable extent passed away, and that they look forward to a renewal of former prosperity. Congratulations, the report states, have been extended to the late Engineer, Mr. B. W. Smith, on the excellent result of the year's working, and confidence has been expressed that his successor, Mr. Fred Davies, will endeavour to record similar results in the future.

Gas Profits at Wigan.—The Chairman of the Wigan Gas Committee reported at the monthly meeting a net profit of £19,531 on the working of the past financial year, and promised that within measurable time the ratepayers would have a reduction in the price of gas, with other benefits. In five years the gas department have accumulated profits of £50,000; and the question was debated how these should be distributed—whether there should be a lessening of the capital debt, renewal of the works, or an immediate reduction of charges to the consumers.

Oswestry Price Reduction.—The Oswestry Gas Company are reducing the price of gas from July 1 by 5d. per 1000 c.ft. to ordinary consumers. The consumers through prepayment meters are to receive a bonus of 17½ p.ct.

Blyth Gas Company.—The Directors of this Company have issued by tender, a parcel of 5 p.ct. ordinary stock, subject to sliding-scale clauses, at a reserve price of £110 p.ct.; the result being that the amount of £35,000 asked for has been largely oversubscribed at prices varying from £112 10s. to £110 p.ct. The total amount allotted is £36,534.

Bakewell Gas Undertaking.—At a meeting of the Bakewell Urban Council, a letter was received from the Gas Engineer, Mr. T. W. Tiplady, thanking the Council for their kindness and sympathy in his recent illness. Replying to a question, the Clerk stated there was no doubt that, but for the recent heavy litigation, there would have been a handsome profit this year on the gas-works.

Meter Testing in London.—The Public Control Committee of the London County Council have received tenders for the erection of the new gas-meter testing office at Helmet Row, Finsbury, and have decided to accept that submitted by Messrs. W. J. Maddison, Ltd., at a total cost, including incidentals, of £13,755. They point out that, in view of the continued extreme pressure of work in the gas-meter testing service, it is very desirable that the erection of this new station should be put in hand without delay.

Modification of Charges at Clayton-le-Moors.—At the Clayton-le-Moors Council meeting on June 7, Mr. Whittaker called attention to the Accrington Board's application for an Order modifying the method of charges. He suggested that the Board should make a public statement to consumers so that they could see it was merely an alteration of system, and that the introduction of the therm principle would not materially affect the charges. There had been considerable controversy as to the advisability of accepting the therm method. If some statement were made, the consumers would feel they were not being taken advantage of.

Probable Reduction at Stourbridge.—At a recent meeting of the Stourbridge Town Council, Alderman E. Fiddian, in proposing the report of the Gas Committee, complimented the Manager (Mr. C. H. Webb) and the staff generally on the result of the year's working of the gas undertaking. It had resulted in between £400 and £500 coming to the Council more than the amount for which they had budgetted. This was after making ample provision for the upkeep and renovation of the new plant. With reference to the price of gas, the Committee had come to no definite decision, but were hoping at the end of the present quarter to make a reduction in the price both for lighting and power.

Potteries Gas-Supply Inquiry.—In connection with the big scheme for the central station of the gas supply of the Potteries, an inquiry was recently held at Stoke into an application by the Stoke-on-Trent Corporation for sanction to borrow £83,100 for purposes in connection with the linking-up of the Stoke and Fenton Gas-Works. The inquiry was conducted by Mr. A. W. Brightmore. The Town Clerk (Mr. E. B. Sharpley) explained that the scheme prepared by Mr. A. Mackay (the Gas Engineer) had been submitted to an expert of the highest standing, and he, without any qualification, supported the proposals. The present application was in connection with a scheme which formed part of the larger project, having for its object the centralization of the gas manufacture in the district, embracing an area of 20,762 acres. They hoped it would result in a very material cheapening of the gas throughout the district. The Town Council had hoped that they would have been allowed to commence this work without an inquiry—or, at least, before an inquiry was held. The Ministry, however, thought otherwise; and the Council had done nothing pending the receipt of sanction to the expenditure, which they hoped would not be long delayed.

Lincoln Gas Undertaking.—A strong financial position in regard to the Lincoln gas undertaking was disclosed by the Chairman of the Committee, Ald. F. Wallis, at the last meeting of the City Council, in dealing with the results of the past year's operations. He stated that on March 31 there was £36,626 standing to their credit. Out of this £5000 had been applied towards the relief of the rates, leaving them with £31,626. Of this amount it was proposed to apply £17,000 to the reserve fund. A sum of £5000 was required to improve the position at Bracebridge, between £8000 and £9000 was needed for new mains, between £5000 and £10,000 for improvements at the Newland works, and £10,000 to £12,000 for working capital. As to the year ahead, they had reduced the price of gas from 4s. to 3s. 3d. per 1000 c.ft., which would mean a decrease in revenue of about £15,000. They expected having to pay £2000 or £3000 more for coal; and he was not looking forward to having a large amount in hand at the end of the year. Altogether, during the past 38 years, about £65,000 had been contributed from the profits of the gas undertaking in relief of rates; and they had never had to borrow during this period. Mr. Milner, who seconded the adoption of the report, which was agreed to, expressed gratification that the Committee possessed such an excellent Chairman as Alderman Wallis.

Mr. Harold G. Palmer, Deputy Chairman of the British Gas Light Company, last Wednesday, at Hull, presented the Royal Humane Society's certificate to Charles Shakespeare, one of the Company's workmen, in recognition of his gallantry in saving a boy from drowning. Accompanying the certificate was a timepiece, suitably inscribed, from the Directors, and a pipe from Mr. Harold E. Copp (the Resident Engineer and Manager).

During a promenade concert in the Blackpool Tower Ballroom, smoke was observed coming from the doorway at the top of a flight of stairs leading to the offices of one of the officials. There was no alarm among the audience, who obeyed the request of the attendants to leave quietly. When the fire brigade arrived, it was discovered that fusing in connection with the electric lighting had set fire to the gas-pipe in a passage underneath the ballroom. The damage was slight.

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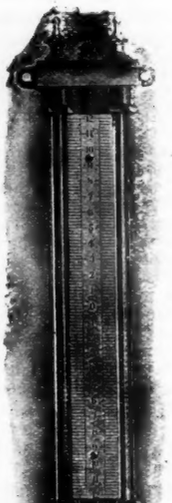

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STOCK MARKET REPORT.

THE week just concluded on the Stock Exchange was less roseate than its predecessor, chiefly owing to the seductive attractions of Epsom which turned men's minds from other markets. A good start on Monday was made by the gilt-edged division; and Home Government issues, followed by some weaker brethren, advanced. But it did not last long, and prices in general shrank. Rails, both Home and Argentine, were weaker; but Canadians held pretty steady. In the Foreign Market were one or two fair points—*e.g.*, French and German; but Turks, after a good start, fell to pieces.

Business in the Gas Market was good—sportive distractions being allowed for—and was fairly well distributed over the list. The tone was quite firm, and changes of quotation were all in the upward direction, though naturally less numerous. Alliance and Dublin rose 4, ditto debenture 3, Bombay ¼, Bournemouth "B" ½, Continental Union 4, and Primitiva 4 p.ct. debenture 2.

The following transactions in gas during the week were recorded: On Monday, Brighton and Hove original 177¾, Commercial 4 p.ct. 97½, 98, Continental Union 40, 40½, 41½, European 9, 9¼, Gas Light ordinary 100⅝, ditto 3½ p.ct. maximum 67½, 68½, Imperial Continental 165, 165½, 165⅞, 166½, Primitiva 7s. 6d., 8s., ditto 5 p.ct. preference 36s. 6d., 37s., ditto 4 p.ct. debenture 72, South Metropolitan 99, 99¼, Wandsworth "B" 117⅝, Croydon 6 p.ct. debenture 102. On Tuesday, Alliance and Dublin 72⅜, Brentford "B" 103, British "A" ordinary £12 16s., ditto "B" £11 16s., Commercial 3½ p.ct. 97½, Gas Light ordinary 100, 100¼, 100½, 100⅝, ditto 3½ p.ct. maximum 68, 68⅜, Imperial Continental 165½, 167, ditto 3½ p.ct. debenture 76¾, 77, Monte Video 60, Primitiva 5 p.ct. preference 36s. 6d., 37s., Sheffield "B" and "C" 101½, South Metropolitan 99, 99⅝, 99¾, ditto preference 99, Wandsworth "B" 115. On Wednesday, Alliance and Dublin 4 p.ct. debenture 65, Cape Town 4½ p.ct. preference 6⅞, Commercial 4 p.ct. 99¼, ditto 3½ p.ct. 99½, European 9¼, Gas Light ordinary 100, 100⅛, 100¼, 100⅜, 100⅝, 100¾, ditto 3½ p.ct. maximum 68½, ditto 4 p.ct. preference 81⅛, 82, 83, ditto 3 p.ct. debenture 64½, Imperial Continental 165¼, 165⅝, 166½, 167, Monte Video 59, Primitiva 5 p.ct. preference 36s., ditto 4 p.ct. debenture 72, South Metropolitan 99⅛, 99¼, 99⅜, Tottenham "B" 106, Brighton and Hove 4 p.ct. debenture 77, Croydon 5 p.ct. debenture 98, Tuscan 5 p.ct. debenture 22½. On Thursday, Continental Union 40, 4, 41½, Gas Light ordinary 100, 100⅛, 100¼, 100⅜, 100¾, Hastings and St. Leonards 3½ p.ct. 76½, 77, 77½, Imperial Continental 165⅛, 165⅜, ditto 3½ p.ct. debenture 76½, 76¾, Newcastle 88½, Primitiva 4 p.ct. debenture 72½, South Metropolitan preference 99, South Suburban 102½, Croydon 5 p.ct. debenture 100, Wandsworth new issue 101½, Danish 5 p.ct. preference 6. On Friday, Alliance and Dublin 73½, Bournemouth "B" 12½, 12¾, British "A" ordinary 12⅝, 12⅞, ditto "B" 11⅝, 12½, Commercial 4 p.ct. 99, Continental Union 43, 43½, 44, Gas Light ordinary 100, 100⅛, 100¼, 100⅜, ditto 3½ p.ct. maximum 68, ditto 3 p.ct. debenture 63½, Imperial Continental 165, 166, 166½, 167, Plymouth and Stonehouse 109, 110, San Paulo 6 p.ct. preference 5⅝, South Metropolitan 99, 99⅜, ditto 6½ p.ct. debenture 106½, Tottenham "B" 105, Wandsworth "B" 116, Danish 5 p.ct. preference 6½.

In the Money Market there was a succession of quick changes. At the opening, supplies were so abundant that money was to be had on very easy terms. This, however, did not last long, and by Wednesday the position had stiffened materially. But this state of things in its turn gave way, and rates were decidedly comfortable at the close. Discount kept in step. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
131,978	Stk.	Feb. 22	—	5%	Aldershot 5 p.c. max. C.	..	74—79	...
190,492	,,	,,	4	4%	Do. 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Apl. 5	2½	5%	Alliance & Dublin Ord.	59—64	70—75	72 3/16—73½
374,000	,,	Jan. 11	4	4%	Do. 4 p.c. Deb.	76—79	63—68	65
380,000	5	May 17	7½	4/-	Bombay, Ltd.	5½—6½	5—5½	...
100,000	5	Feb. 22	16	8/-	Bournemouth Gas and Water { 5 p.c.	..	11—12	...
383,110	10	,,	7	7/-	Bournemouth Gas and Water { B 7 p.c.	15—15½	12—13	12¼—12½
115,000	10	,,	6	6/-	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	10½—11½	...
162,065	—	Dec. 29	—	4%	Bournemouth Gas and Water { 4 p.c. Deb.	..	77—82	...
992,045	Stk.	Feb. 22	14	6t/-	Brentford A Consolid.	261—266	102—107	
734,920	,,	,,	11	6t/3	Do. B New	204—209	102—107	103
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	85—90	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	78—83	...
814,775	,,	Mar. 8	11	11½%	Brighton & Hove Orig.	208—213	175—180	179—179½
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	130—135	...
1,272,500	Stk.	Feb. 22	5	5%	Bristol 5 p.c. max.	..	95—96	..
570,000	20	Mar. 22	12½	10/-	British A Ord.	44—45	12¾—13½	12¾—12⅞
10,000	10	Dec. 29	—	7/-	Do. 7 p.c. Pref.	..	12—13	..
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
220,335	,,	Dec. 29	4	4%	Buenos Aires 4 p.c. Deb.	85—87	57—60	...
100,000	10	May 17	—	—	Cape Town & Dis., Ltd.	1¾—2½	6¾—7½	...
100,000	10	May 3	—	4/6	Do. 4½ p.c. Pref.	4—6	6—7	6½
100,000	Stk.	Dec. 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	72—77	
237,860	,,	,,	—	7½%	Cardiff 7½ p.c. Deb.	..	109—114	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	Mar. 8	5/9/4	60/-	Commercial 4 p.c. Stk.	106—108	97—100	97½—99¼
360,000	,,	,,	5½	60/-	Do. 3½ p.c. do.	103—105	97—100	97½—99½
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69¾—71½	57—62	..
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	42—47	40—44
200,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	70—75	...
660,000		Mar. 8	—	6%	Croydon sliding scale.	..	103—106	...
284,975		,,	—	5%	Do. max. div.	..	83—86	...
492,270	Stk.	,,	6	4½%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Apl. 5	—	5%	East Hull 5 p.c. max.	..	..	...
1,002,180	10	Jan. 25	10	5/0	European, Ltd.	17½—18	9—10	9—9¼
10,546,120	Stk.	Feb. 8	1/17/4	52/-	Gas Light & Coke { 4 p.c. Ord.	98—102	99½—101½	100—100¾
2,600,000	,,	,,	3½	35/-	Gas Light & Coke { 3½ p.c. max.	76—79	67—69	67½—68¼
4,062,235	,,	,,	4	4%	Gas Light & Coke { 4 p.c. Con. Pref.	96—99	81—83	81⅛—83
4,761,930	,,	Dec. 14	3	3%	Gas Light & Coke { 3 p.c. Con. Deb.	72½—74½	62—65	64½—65½
130,000	,,	Dec. 11	10	10%	Gas Light & Coke { 10 p.c. Bonds	..	..	...
	—	—	—	—	Gas Light & Coke { 7½ p.c. Ilford Deb.	..	..	...
82,500	,,	Mar. 8	5	65/7½	Hastings & St. L. 5 p.c.	..	92—97	...
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	75—78	76¼—77½
70,000	10	May 17	£1	10%	Hongkong & China, Ltd.	16½—16¾	14—16	...
86,600	Stk.	Mar. 8	9	9%	Hornsey 7 p.c.	..	147—152	...
1,976,000	,,	May 31	9	£17	Imperial Continental	150—160	163—168*	165—167
404,800	,,	Feb. 8	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	75—78	76½—77
235,242	,,	Mar. 8	6¼	6¼%	Lea Bridge Ord. 5 p.c.	119—121	97—102	...
1,498,905	,,	Feb. 26	10	17/6	Liverpool 5 p.c. Ord.	..	..	...
600,000	,,	Mar. 22	—	7%	,, 7 p.c. Pref.	..	106—109	...
165,736	,,	Feb. 22	7/5/-	80/-	Maidstone 5 p.c.	..	107—112	...
63,480	,,	Dec. 29	—	3%	Do. 3 p.c. Deb.	..	53—58	...
75,000	5	June 29	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4¾	3¾—4¼	...
100,000	100	Apl 5	4½	4½%	Monte Video, Ltd.	99—101	97—100	...
341,920	Stk.	May 17	4	4%	Newcastle & Gatsh'd Con.	11½—12	57—62	59—60
1,875,892	,	Feb. 22	4½	4½%	Do. 4 p.c. Pref. Stk.	99¼—99½	88—89	88½
250,166	,,	,,	—	4%	Do. 3½ p.c. Deb.	..	76—78	...
529,705	,,	Dec. 29	3½	3½%	North Middlesex 10 p.c.	82—83	70—72	...
15,000	10	Aug. 26	—	7/6	,, 7 p.c.	..	..	...
55,940	10	Mar. 8	1/14/-	7/8⅜	Oriental, Ltd.	14—15	12—13	...
300,000	Stk.	May 3	8	8%	Plym'th & Stonh'se 5 p.c.	117—122	97—102	...
188,120	Stk.	Dec. 29	—	72/6	Portsea Island, B	..	107—112	109—110
60,000	50	Mar. 8	13	65/-	Do. C	128—131	103—108	...
100,000	50	,,	12	60/-	Primitiva Ord.	118—121	100—105	...
290,069	5	—	8	—	Do. 5 p.c. Pref.	5¼—6	⅛—¼	7/6—8/-
499,960	5	—	5	—	Do. 4 p.c. Deb.	4¼—5	1¼—2¼	36/—37/-
521,600	100	June 1	4	4%	Do. ,, ,, 1911	91—93	70—73*	72 —72½
600,000	Stk.	Jan. 25	4	4%	River Plate 4 p.c. Deb.	..	57—60	...
346,198	,,	Dec. 29	4	4%	San Paulo { 6 p.c. Pref.	85—87	57—60	.
150,000	10	Mar. 22	6	6/-	San Paulo { 5 p.c. Deb.	10½—11	5¼—6	5¾
125,000	50	July 3	5	5%	Sheffield A	47—49	38—41	...
135,000	Stk.	Mar. 22	10	5%	Do. B	223—224	100—102	...
209,984	,,	,,	10	5%	Do. C	222—224	100—102	101½
525,500	,,	,,	10	5%	Shrewsbury 5 p.c.	220—222	100—102	101½
133,201	Stk.	Sept. 15	4	4%	South African	..	..	...
90,000	10	May 31	9	9/-	South Met. Ord.	10½—11½	8—10*	...
6,609,895	Stk.	Feb. 22	5/4/-	60/-	Do. Red. Pref.	111—113	99—101	99—99⅞
250,000	,,	Jan. 11	—	5%	Do. 3 p.c. Deb.	..	97—99	99
1,895,445	,,	,,	3	3%	Do. 6½ p.c. Deb.	72½—74½	63—65	
734,000	,,	Mar. 8	—	6½%	South Shields Con. Stk.	..	105—107	107½
91,500	,,	Feb. 22	8½	8½%	S'th Suburb'n Ord. 5 p.c.	157—159	129—131	
1,087,795	,,	,,	6	6%	Do. 5 p.c. Deb. Stk.	114—116	100—103	102½
368,837	,,	Dec. 29	5	5%	S'th'mpt'n Ord. 5 p.c. max.	116—118	95—100	...
647,710	,,	May 3	5	7%	Do. 4 p.c. Deb. Stk.	99—102	88—91	...
121,275	,,	Dec. 29	4	4%	Swansea 7 p.c. Pref. Stk.	..	73—78	...
250,000	,,	Mar. 8	—	70/-	Do. 6½ p.c. Deb. Stk.	..	102½—104½	...
200,000	,,	Dec. 29	—	6½%	Tottenham District { A 5 p.c.	..	106—108	...
120,000	,,	Feb. 22	—	7½%	Tottenham District { B 3½ p.c.	135—138	123—128	...
782,275	,,	,,	6	6%	Tottenham District { 4 p.c. Deb.	115—117	102—107	105—106
181,255	,,	Dec. 14	4	4%	Tynemouth 5 p.c. max.	87—89	75—80	...
258,251	Stk.	Mar. 22	5	5%	Wandsworth, Wimbledon, and Epsom—	108½—109	90—92	...
					Wandsworth A 5 p.c.	151—156	130—135	...
30,000	,,	Feb. 22	8½	87/6	Do. B 3½ p.c.	129—134	115—120	115—117½
255,636	,,	,,	6½	72/6	Do. C	..	100—105	...
108,075	,,	,,	—	61/3	New Ordinary	..	100—105	...
140,865	,,	,,	—	61/3	Wimbledon 5 p.c.	117—122	110—115	...
152,000	,,	,,	6½	68/9	Epsom 5 p.c.	131—136	115—120	...
98,000	,,	,,	6½	73/9	3 p.c Deb. Stk.	66—69	58—61	...
88,416	,,	Dec. 29	3	3%				

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